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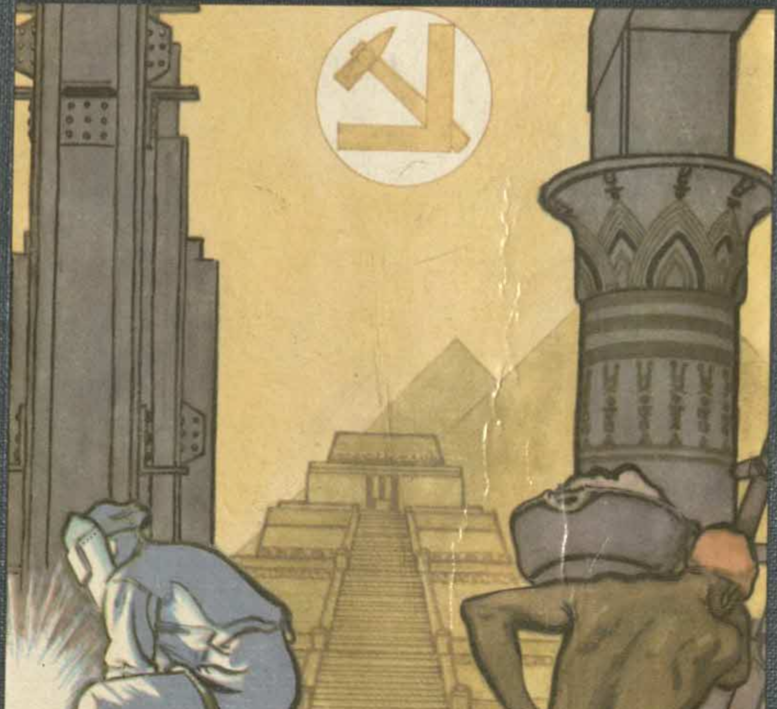

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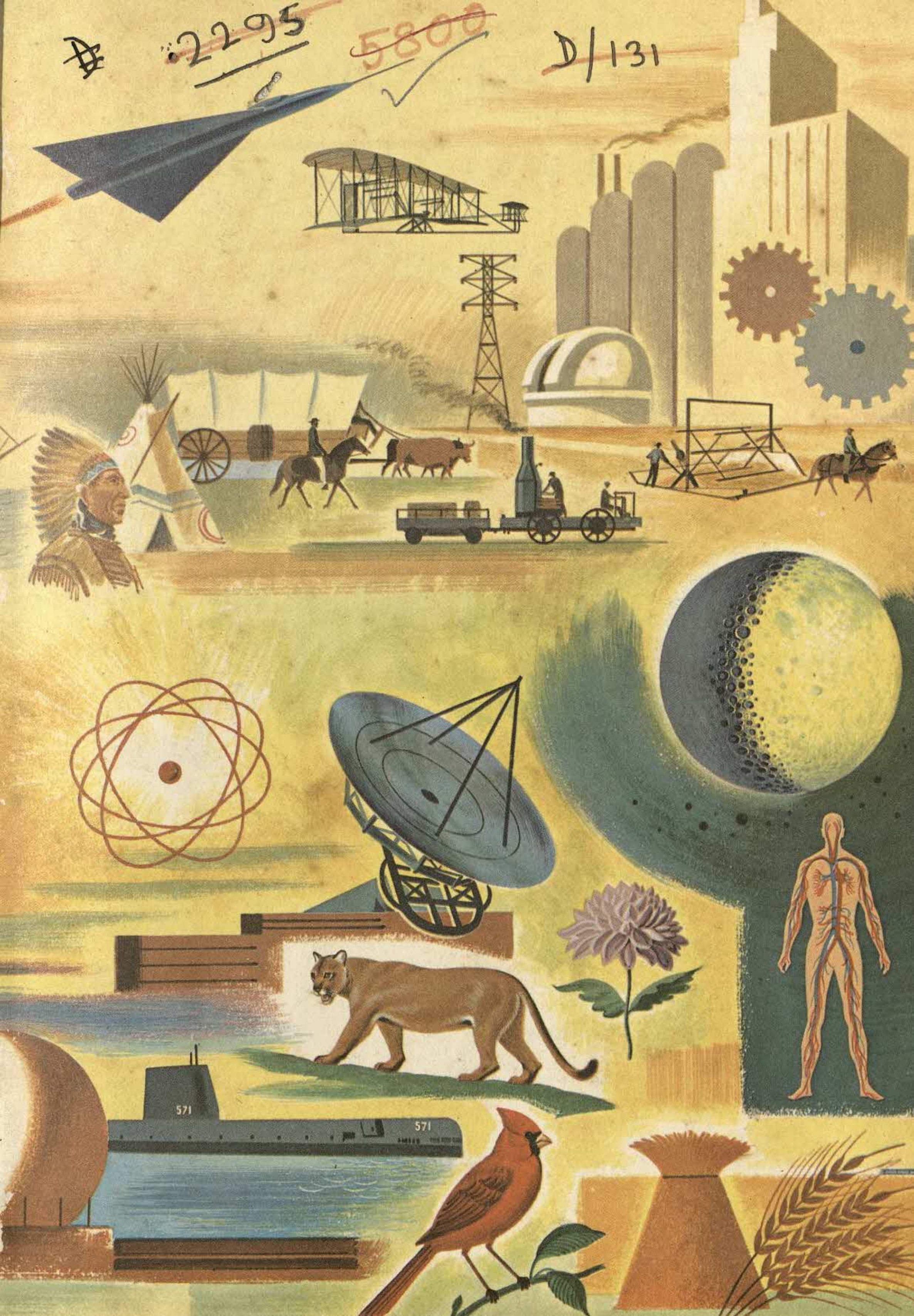

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The Pictorial Encyclopedia

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PRONUNCIATION

The pronunciation of titles is indicated by accenting the word or by respelling it phonetically in italics. In the phonetic spelling, letters are used to indicate the sounds which they most commonly represent.

A vowel is *short* when followed by a consonant in the same syllable, unless the syllable ends in silent *e*.

A vowel is *long* when the letter occurs in a syllable which ends in silent *e* or when ending an accented syllable.

The hard sound of *c* is represented by *k*.

The hard sound of *s* is represented by *z*.

The foreign sounds which have no equivalent in the English language are represented as follows:

N for the French *n*, as in Breton: (**Breton,** *bre toN′*).

ö for the German *ö*, as in Göttingen: (**Göttingen,** *gö′ ting en*).

ü for the German *ü*, as in Blücher: (**Blücher,** *blük′ur*).

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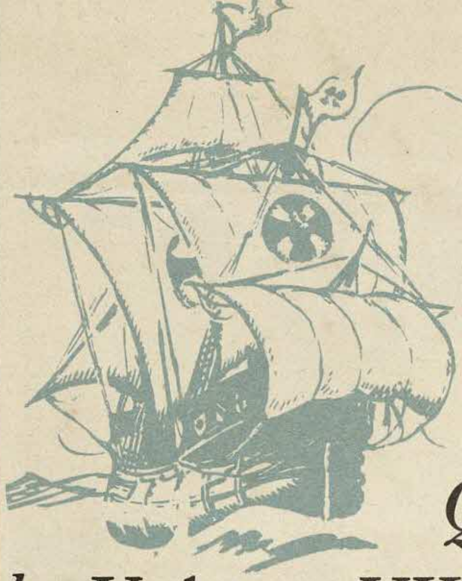
A Wonderland
PICTURE STORY
Volume VIII

Courtesy of the Section of Fine Arts,
Public Buildings Administrator

MAGNA CHARTA. King John ruled England so harshly that in 1215 his barons made him sign the Magna Charta. The document is called "the cornerstone of English liberty." See page 2273.



Questions answered by Volume VIII

What is the difference between horizontal and vertical labor unions?

Horizontal unions are organizations of separate crafts or trades, as the electricians' union, or the painters' union. Vertical unions are organizations of all the men working for one company or industry, irrespective of their particular jobs. See LABOR ORGANIZATIONS.

What brings the tears to our eyes?

When we are moved by excessive grief or joy, our lachrymal glands become more active and secrete more liquid than usual. We "cry" when this surplus moisture overflows the lower lid. See LACHRYMAL GLAND.

What type of government does Lapland have?

Lapland has no government at all, because, politically, it does not exist. The name Lapland is commonly given to the territory inhabited by the Lapps, comprising Northern Norway, Sweden, Finland, and the Kola Peninsula in Russia. See LAPLAND.

What makes autumn leaves so colorful?

Each year as it gets cooler, the green chlorophyll in the leaves decomposes into its various substances, at the same time sending food to the tree cells to be stored for the winter. The chemical change in the chlorophyll causes the leaves to take on different hues. See LEAVES.

Was Robert E. Lee sympathetic to the Southern cause in the Civil War?

He was opposed to secession, but loyal to his state, Virginia. When it seceded, he reluctantly resigned from the United States Army, later to take command of the Confederate forces. See LEE, ROBERT EDWARD.

Why was Democratic Andrew Johnson teamed with Lincoln on the Republican ticket in 1864?

Northern Republicans hoped to gain favor (and votes) from the South by nominating a Southerner loyal to the Union, Democratic or not. See JOHNSON, ANDREW.

What causes thunder?

Every lightning flash which forces its way through the atmosphere heats the air adjacent to it. The very rapid expansion and compression of the air as a result of this heating sets up waves which come to us as the sound of thunder. Long rolls of thunder are echoes from the clouds. See LIGHTNING.

What is the origin of the term *lobbying?*

People who are interested in the passage or defeat of particular bits of legislation often frequent the *lobbies* of capitol buildings in order to persuade the legislators at first hand. Hence, the practice has come to be called lobbying. See LOBBY AND LOBBYING.

Who put the United States Constitution into writing?

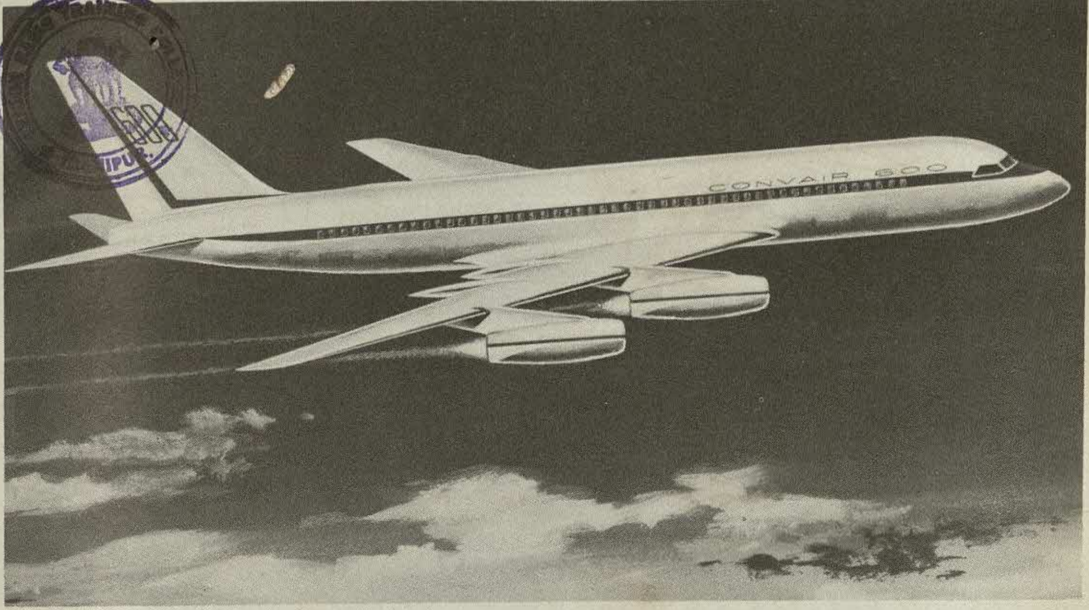
Acting as secretary of the Constitutional Convention, James Madison wrote much of the draft of the original document. In addition, his plan of proportional representation in Congress was adopted, although the membership of the upper house, two Senators from each state, was set that way as a compromise to Madison's scheme. See MADISON, JAMES.

When was the first permanent settlement established in New England?

Pilgrims who founded a colony at Plymouth in 1620 were the first to settle in New England. Earlier explorers did not attemp to stay. Plymouth later joined other Puritan settlements to form the Massachusetts Bay Colony. Establishment of Plymouth followed by thirteen years the founding of the first English colony in America at Jamestown, Va. See MASSACHUSETTS.

What names, familiar in the Christian religion, are also revered by the Mohammedans?

Moses, Noah, and Christ are honored as saints in the Koran, Bible of the Mohammedans, and are placed in the seventh heaven, nearest to God. See KORAN.



JET AIRLINERS TRIM TRAVEL TIME
An old scientific principle applied to modern engine design gives jet planes air-splitting speed.

JET PROPULSION. For every action there is an equal and opposite reaction. Sir Isaac Newton stated this principle in 1687. It is demonstrated in nature in many ways, including the movements of fish, frogs, and squids. The same principle is the basis for the remarkable speeds achieved by modern jet aircraft.

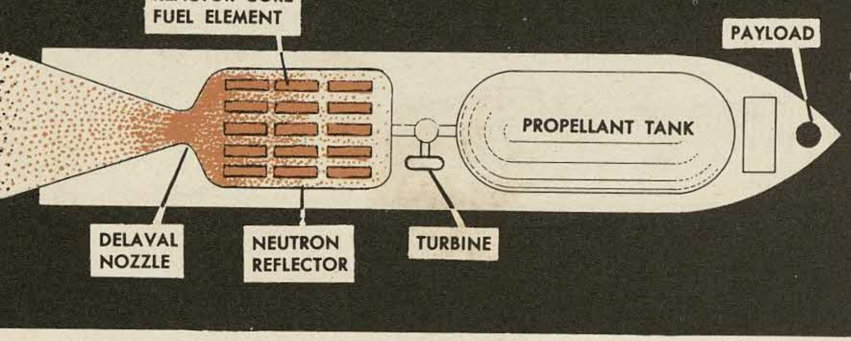
When fish squirt water rearward through their gills, they react by shooting forward. The action is the backward squirt of water. The reaction is forward motion. When a frog jumps from a piece of driftwood, the frog's forward motion is the action and the backward movement of the driftwood is the reaction. Squids have a siphon from which they eject water. The squid moves away from the direction of the ejected water. Because the siphon is movable, the squid can react forward or in reverse.

The jet principle also is demonstrated in man-made objects less complex than a jet plane or jet helicopter. If water is allowed to enter a loose garden hose at high pressure, the mouth of the hose flips away from the forward direction of the water. When a shotgun is held against the shoulder and fired, the forward action of the bullet creates a backward recoil or "kick" against the shoulder.

Jet planes hurtle through the sky by sending a jet of hot gases from the tail of the plane. The reaction of the plane is a forward push away from the direction of the blast. You can demonstrate this motion with a toy balloon. Blow it up and hold it by the neck without tying it. When you release the balloon, it shoots through the air in the opposite direction from the nozzle. When the air escapes through the nozzle opening, air also pushes against the inside of the balloon. A gas under pressure tends to exert equal force in all directions. This pressure sends the balloon away from the escaping air and the balloon is jet propelled. Jet propulsion does *not* operate by pushing against the medium (air or water) through which the object travels. Jet propulsion is even more effective in a vacuum.

Jet engines include rockets, ramjets, pulsejets, turbojets, turboprops, and rocket rams. All types of jet engines must use heat-resistant metals to withstand the extremely high temperatures generated by the powerful blasts.

The Rocket is different from other



SPACE PROBER

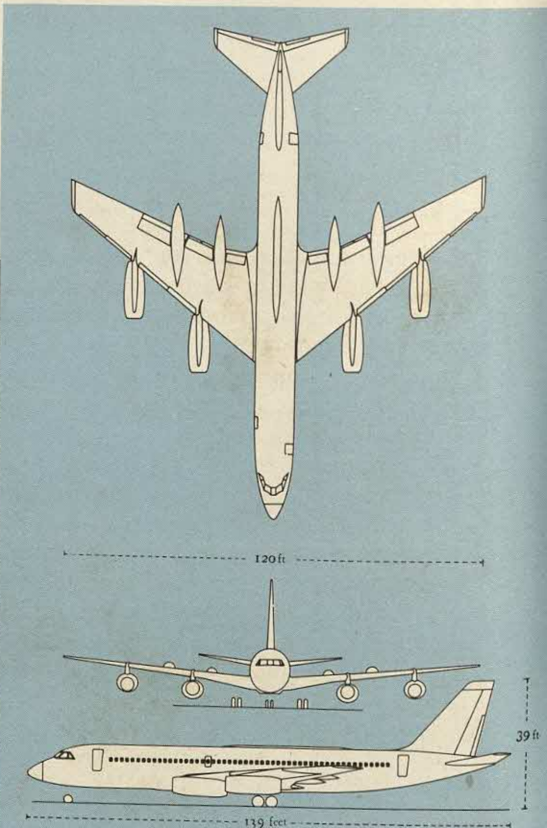
This nuclear rocket with liquid hydrogen propellant would have to weigh about 3,000,000 pounds to generate enough thrust to launch a 100,000-pound space ship.

jet engines because it packs its own power. While other jet engines rely to some extent on oxygen from the atmosphere, the rocket carries along all of its combustible material. For this reason, the rocket is particularly suited for space travel.

The Ramjet, or "flying blowtorch," must be launched by rocket or some other means because the ramming operation does not begin until a minimum speed of 500 miles an hour has been reached. When air is rammed, or compressed, into the ramjet's tube, it mixes with fuel in a combustion chamber and burns. The burning gas is expelled through a rear exhaust. The tapering, then widening design of the ramjet tube increases the speed of the air to supersonic velocity, creating a shock wave that raises the temperature and pressure of the air. Before the gas spurts from the engine it reaches an even higher velocity. The result is an enormous thrust. Because the ramjet has no moving parts, it is easy to build, light in weight, and comparatively cheap.

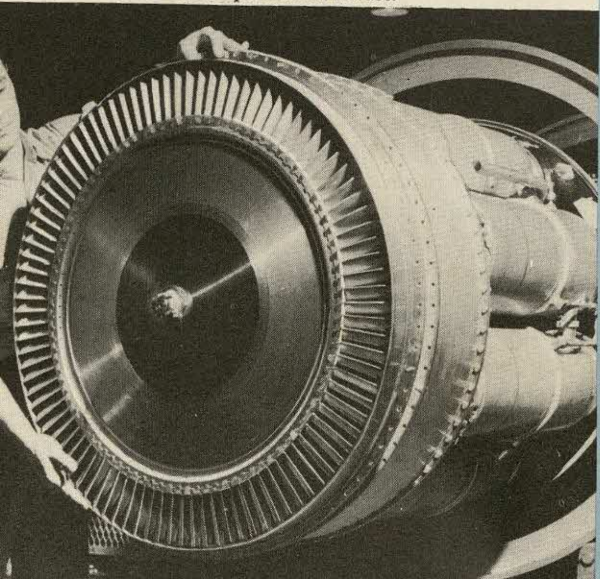
The Pulsejet does not take in a continuous flow of air. Flap valves on the air-intake are opened by the ramming air and closed by the expanding gas in the combustion chamber. The jet occurs in bursts.

The Turbojet operates like the ramjet, but it also has an air compressor which feeds compressed air to the combustion chamber. As a result, the turbojet can start under its own power, yet achieve terrific



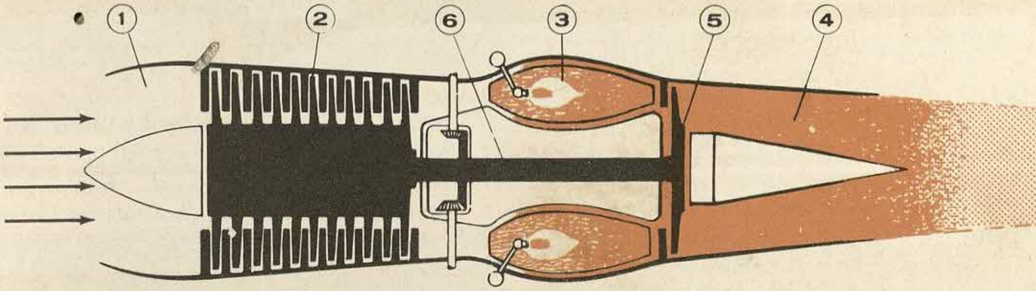
"FILL IT UP" MEANS 15,000 GALLONS

Powerful jet engines and large fuel capacity enable giant airliner to fly nonstop Los Angeles - New York City in 4 hours. The four canoe-shaped "speed capsules" on trailing edge of wings reduce drag, hold extra fuel.



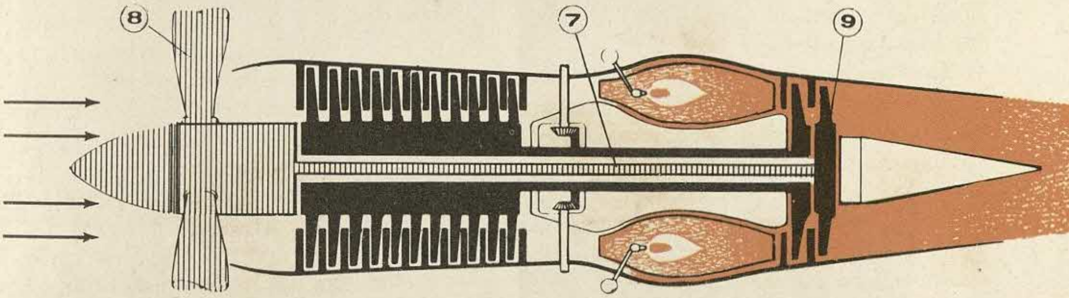
THE HEART OF A TURBOJET

A mechanic checks a turbine wheel during the assembly of a jet engine to be used to power a turbojet fighter plane. The powerful turbojet produces more than 5,000 pounds of thrust.



TURBOJET AND PROPJET

Turbojet engine (above) gulps air through intake (1). Compressor (2) crams air into metal combustion chambers (3), where fuel is added and burned. Hot, expanding gases jet out through exhaust (4). On the way out, these gases spin turbine (5), which completes cycle by operating compressor through connecting shaft (6).



Propjet, or turboprop, engine (below) goes through same operations. In addition, expanding gases operate a second turbine (9), which operates airscrew propeller (8) through another connecting shaft (7).

blast when air is rammed into its tube at high speed.

The Turboprop, also called a *propjet,* uses the same principles as the turbojet, but the jet operates a turbine which powers a propeller.

The Rocket Ram is a ramjet with a rocket, containing liquid oxygen and fuel, inside it. Thus the rocket ram, like the turbojet, has the advantage of being able to start itself, and, at high speed, achieve the further thrust of the ramjet.

Ramjets and pulsejets have been used to power helicopters. Jets are placed at the tips of the rotor blades.

Jet propulsion has a long history. The Greek *aeolipile,* the first steam engine, was jet propelled. Newton designed a jet propelled steam carriage and in 1787 James Rumsey invented a jet propelled boat. Most progress in jet propulsion has been made since the 1930's, when the principle first was applied to airplanes. Countries that were active in the development of jet-propelled flight include Great Britain, the United States, Russia, France, Germany, Italy, and Canada. The first scheduled jet airliner flights began in 1952. See AIRPLANE; ROCKET.

JETTY. A wall built into a river, lake, or sea to help direct water currents is a jetty. Built parallel to a river's banks, to narrow and so speed up the current, jetties help to deepen the channel for navigation.

One of the most notable jetties has been constructed at the delta of the Mississippi River. The current brings down vast quantities of sand and silt which settled to the bottom in the four channels, or passes, to the Gulf of Mexico. In time these deposits nearly closed the river to navigation. Captain James B. Eads suggested that jetties would force the silt and sand out to sea. The jetties in the South Pass were completed in 1875, and cleared a channel thirty feet deep by 1877. Jetties then were built in the other passes.

James B. Eads, an engineer, convinced government authorities that two long walls built along the banks and out into the stream would force the water into a narrower and swifter stream, which would wear away the bars and keep the entrance clear. The first pair of jetties, at the South Pass, justified the belief of Eads, and led in 1906 to the building of similar ones at the Southwest Pass.

JEW'ELRY. Man's love of adornment early led him to decorate himself with many different types of personal ornaments. Those of metal and rare stones are known as jewelry. It takes many forms and has been used to decorate all parts of the body. Rings, bracelets, and necklaces are the commonest forms, but jewelry also includes crowns, tiaras, and scepters, medals, belts, and ankle bracelets. Among certain tribes, jewelry is also worn in the form of nose rings. Among primitive tribes, such ornaments have always indicated the importance and wealth of the wearer.

The combination of metals and stones into colorful ornamentation is very old, examples having been found in Egyptian tombs 5,000 years old, and in the ruins of ancient Mycenae, Greece, and Assyria. The art reached a high point of development in the Orient, where there are immense stores of pearls and other valuable gems.

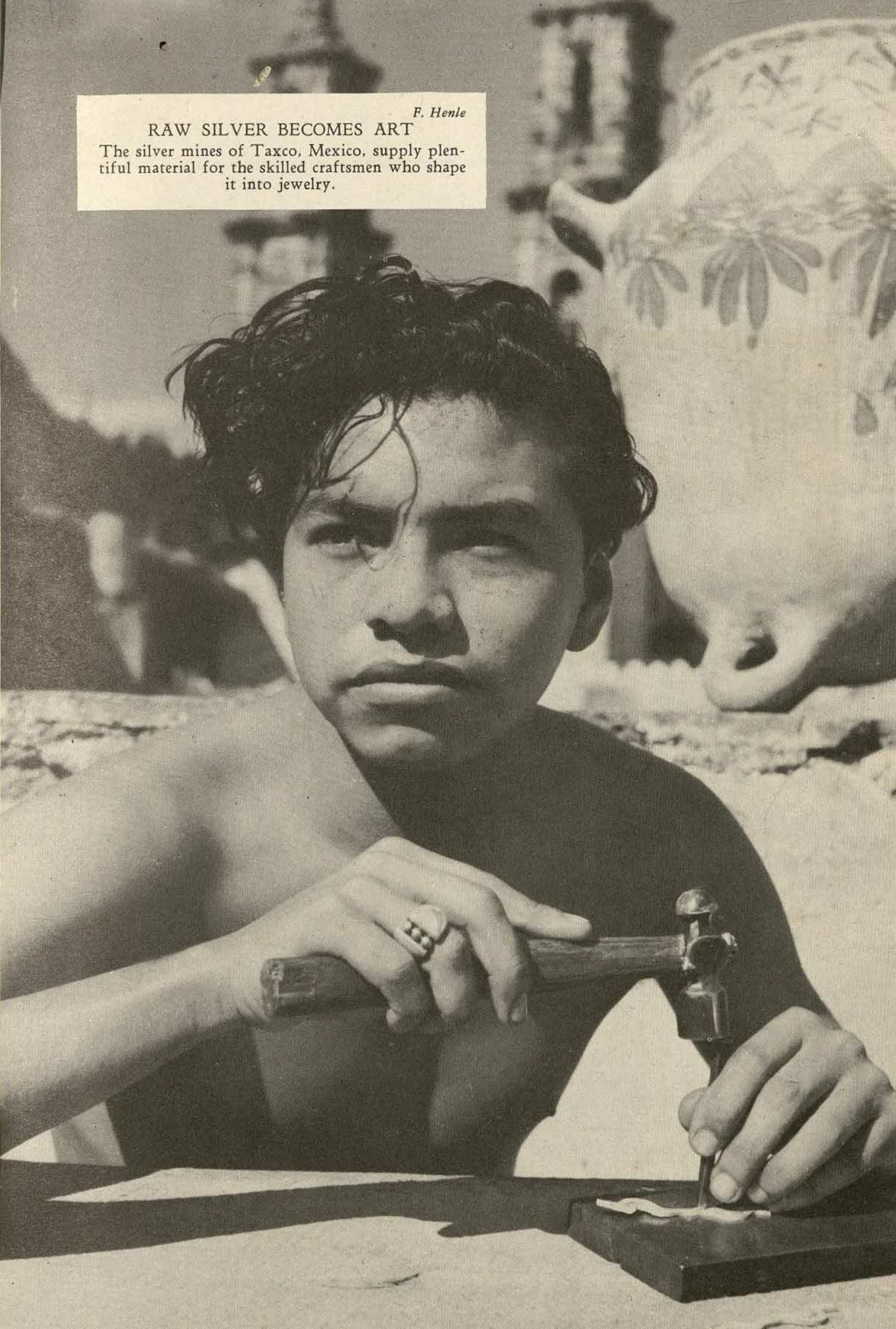
Early jewelry is characterized by delicately wrought design and by a wide variety of human, animal, and geometric forms. In Egypt, the lotus and the scarab, or sacred beetle, were favorite designs, while in Babylonia, gems were cut with designs below the surface, to form signet rings. Jewel making remained a minor art in Greece, but nevertheless reached a high point of perfection. In all of these forms there is exhibited a superior craftsmanship, noticeable in delicate filigrees and inlaying and in the brilliantly enameled brooches. The craft was carried to Europe during the Middle Ages by Byzantine artisans, whose lavish color and design influenced early European jewelers.

Jewel making was not recognized as an independent craft until the Renaissance. Prominent among the artists of the period were Cellini and Ghiberti, whose work is much prized today. Although much of the work of this period is ornate and gaudy, it has appeal in its intricate design and fine workmanship. During the early part of the eighteenth century, there was a temporary revival of the simple, classic designs of Greece and Rome, but this soon gave way to the gaudy jewelry such as was worn at the court of Louis XIV of France.

Manufactured principally in New York, London, Vienna, and Paris, most modern jewelry is machine-made and thus lacks originality in design. However, there is a trend toward simple and original jewelry, led by jewelers such as René Lalique of Paris, who selects stones and metals for pleasing combinations, regardless of their value. Baser metals and inexpensive stones are also becoming more popular in costume jewelry.

Consult the following articles for additional information:

Agate
Amethyst
Birthstones
Cameo
Coral
Diamond
Emerald
Garnet
Gems, Artificial
Gold
Heliotrope
Jade
Jasper
Lapis Lazuli
Onyx
Opal
Pearl
Platinum
Precious Stones
Ruby
Sapphire
Topaz
Turquoise



F. Henle

RAW SILVER BECOMES ART

The silver mines of Taxco, Mexico, supply plentiful material for the skilled craftsmen who shape it into jewelry.

JEW'FISH. In all warm seas there are found immense fish related to the bass, but everywhere called jewfish. Many of them weigh 500 or 600 pounds each. Some are six feet long, and in one species even twelve feet long. The largest in American waters is the *California* jewfish, but the *Florida* jewfish, or "black grouper," is nearly as large. The *spotted* jewfish is found on both the Atlantic and Pacific coasts.

THE GREATEST LAWMAKER
Moses, the man who led Israel from bondage.

JEWS. Persecution, hardship, and war have marked the long story of the Jews, a Semitic people who trace their ancestry back to the days of Babylonian and Egyptian civilization. The 12,000,000 Jews in the world today have retained a kinship hardly equaled by any other people in the world, but their valuable contributions to the world have been of an international character. Greatest of these contributions is in the realm of religion. As the oldest people to believe in one God, the Jews laid the foundations of Christianity and other faiths based on this principle.

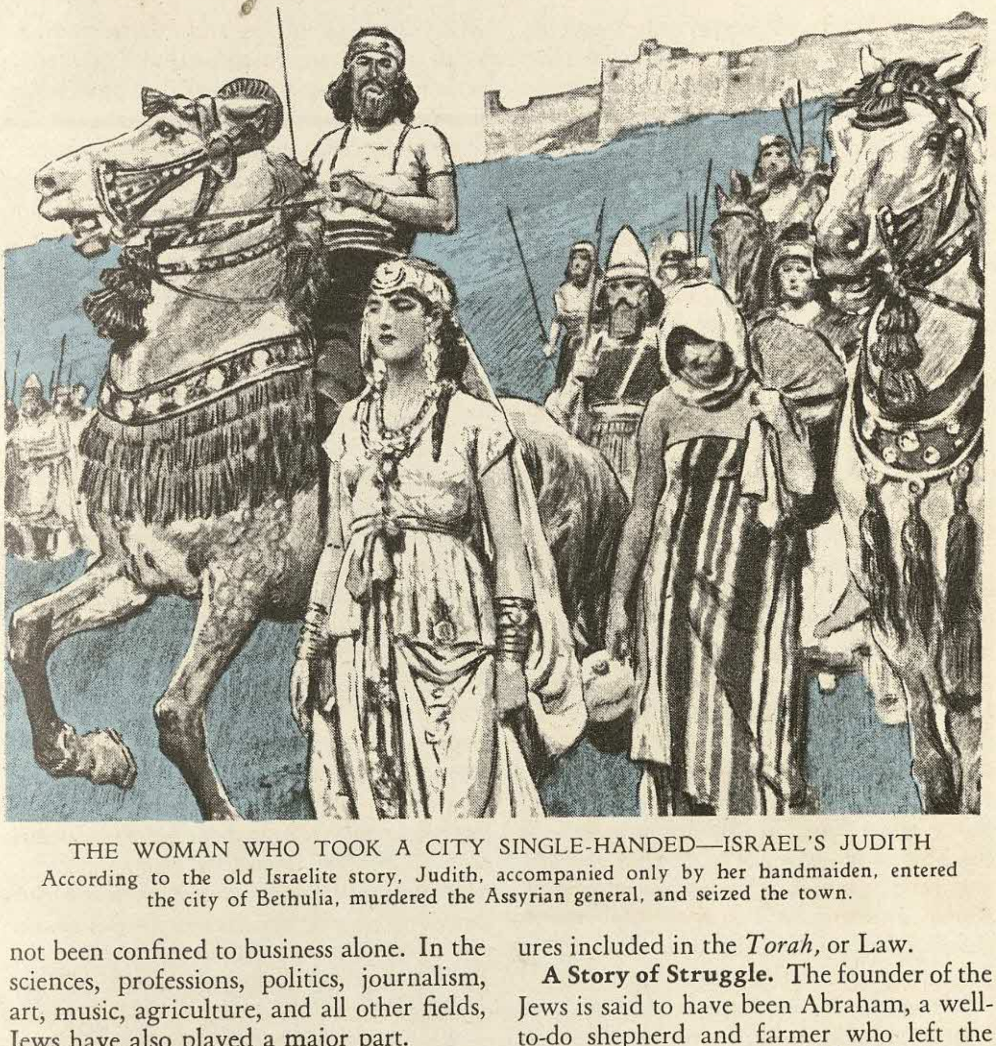
Almost as great in value is the code of morals originated by the Jews and adopted by civilized countries around the world. These morals are based on the Ten Commandments, a set of laws said to have been given to Moses by God.

Another contribution has been in the field of health. The regulations governing the proper foods to eat, cleanliness, and moral habits, which were very important to the perpetuation of the Jews in their nomad days, were adopted by many people in later years.

In language and literature the Jews gave the world the Bible. They helped in the spread of the alphabet, for their system of letters was based on the Phoenician; and, as they traveled throughout the Mediterranean countries, their literature went with them. The music of the Jews also has come down to modern times as a special contribution to art. It is a unique form of music—full of pathos and melancholy melody, yet beautiful and tender.

To civilization in general, the Jews have been a valuable connecting link. When the Egyptian and Babylonian nations were growing up separately, the Jews, as the inhabitants of Palestine, lay midway between the two. They absorbed the culture of both peoples, owing to their captivity first by the Egyptians and then by the Babylonians. As they dispersed throughout the world, they absorbed the learning of the Greeks, the Romans, and the Moors, combined it with their own, and perpetuated a culture that has enriched the modern world.

A Peaceful People. The Jews, in general, are a peaceful people, conditioned to hardship through persecution and wandering. Because, in medieval days, they were forbidden the rights of nobles, they turned to trade and business, which were then considered degrading activities. In modern times the emphasis of the world on trade and economics naturally carried the businessman and trader to a place of high importance in world affairs; and, because the Jews were prominent in these activities, they have been a major factor in the commerce of nations. Yet their pursuits have



THE WOMAN WHO TOOK A CITY SINGLE-HANDED—ISRAEL'S JUDITH
According to the old Israelite story, Judith, accompanied only by her handmaiden, entered the city of Bethulia, murdered the Assyrian general, and seized the town.

not been confined to business alone. In the sciences, professions, politics, journalism, art, music, agriculture, and all other fields, Jews have also played a major part.

Judaism. The religion of the Jews, called Judaism, is today a combination of ancient laws, traditional customs, and doctrines based on the Old Testament and the Talmud. Orthodox Judaism embraces the traditions of the ancient faith, opposing any major change in ritual. Reform Judaism discards much of the old observance, seeking to adapt to modern times and new surroundings. Conservative Judaism offers a middle ground, retaining more than Reform, adapting more than the Orthodox. All are based on the fundamental belief in one God. All share a reverence for the Ten Commandments and some of the other measures included in the *Torah,* or Law.

A Story of Struggle. The founder of the Jews is said to have been Abraham, a well-to-do shepherd and farmer who left the valley of the Euphrates and Tigris rivers to go to Canaan, near the Mediterranean Sea. We next hear of the Jews in Egypt, where at first they were highly respected. Later, however, they were subjected to slavery; and, between 1200 and 1400 B. C., they left the land under the leadership of Moses and his brother Aaron.

In Palestine the people warned against the Philistines, resulting in the founding of a kingdom under Saul. David succeeded Saul as ruler of the Israelites, as they were called then; and his son, Solomon, brought the kingdom to its height in power and prestige. But the heavy taxations of

Solomon's reign weakened the kingdom, and finally the people, organized into twelve tribes, split into two sections, Israel in the northern portion of Palestine and Judah in the south.

In 722 B. C. the Assyrians captured the northern tribes. Taken into captivity, the tribes of Israel disappeared from history, becoming known as the "lost tribes." The southern kingdom, Judah, still existed, and is is from it that the name *Jew* is derived. In 586 B. C. Nebuchadnezzar swept down on Jerusalem and took many Jews into captivity in Babylonia. Later, when the Persians overthrew Babylon, Cyrus gave the Jews their freedom, and they were permitted to rebuild the Temple of Solomon.

The return of the Jews to Palestine brought little peace, for they were conquered by Alexander the Great, and after his death both Egypt and Syria demanded tribute. About 169 B. C., Judas Maccabaeus and his brothers, Jonathan and Simon, overthrew the Syrian rule, creating a new freedom for the Jews which lasted until 65 B. C., when Pompey captured Jerusalem. About thirty years later, Antigonus, the last of the Maccabees, was put to death by Herod, and Judea came directly under the yoke of Rome. In the year 70 A. D., Jerusalem was destroyed again, and the wide dispersal of Jews throughout the world began.

When the Moors conquered Spain, the Jews were held in high esteem, and much of the magnificent civilization built up there was due to Jewish influence. But when the Moors were driven out and Ferdinand and Isabella came to power, they instituted a reign of oppression, and the Jews were either put to death or forced to leave the country.

The Crusades had constituted a reign of terror for all non-Christians in Europe, and the Jews suffered greatly. In 1290 they had been expelled from England by Edward I, and in 1392 France had followed England's example. They fared badly in Germany and other European countries. Finally, in the seventeenth century, Cromwell permitted the Jews to return to England, and since then rights have gradually been restored to them there. The French Revolution in 1789 gave Jews political liberty in France, and in 1807 they secured religious freedom from Napoleon. Some years later Germany gave the Jews freedom. Russia was particularly hostile to Jews under the czars, and the crack of the Cossacks' whips during the *pogroms* was responsible for the emigration of thousands of Jews to America.

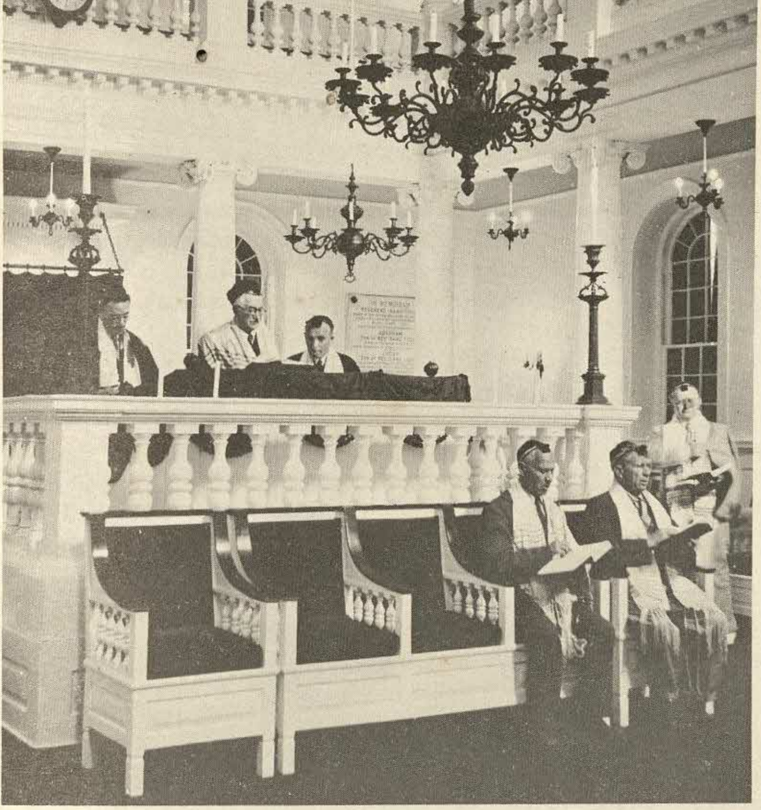
Under the Nazi dictatorship in Germany, Jews were viciously persecuted, deprived of political and civil rights, and forced to migrate to other lands. Later, terrorism changed to murder as the Nazis conducted a methodical program to exterminate Jews in Germany and conquered lands. About six million European Jews were killed before Hitlerism was smashed in World War II.

The State of Israel was established in Palestine in 1948 despite great opposition from Arabs and others. Israel's Law of Return permits almost unrestricted Jewish immigration and the population more than doubled within a decade. Israel now has about 1,800,000 Jewish residents and immigration is continuing. A large number of potential immigrants live in Iron Curtain countries that have discouraged Jewish expression and restricted Jewish emigration.

Before World War II, the world Jewish population numbered about 17,000,000 and was centered in Europe. Now it totals more than 12,000,000. Of this number about 5,250,000 live in the United States. The largest single group, about 2,000,000, is in New York City. Other Jewish communities include those in Canada, 246,000; South America, 680,600; Europe, 3,450,000; Africa, 561,000; and Oceania, 64,500.

Consult also the following articles:

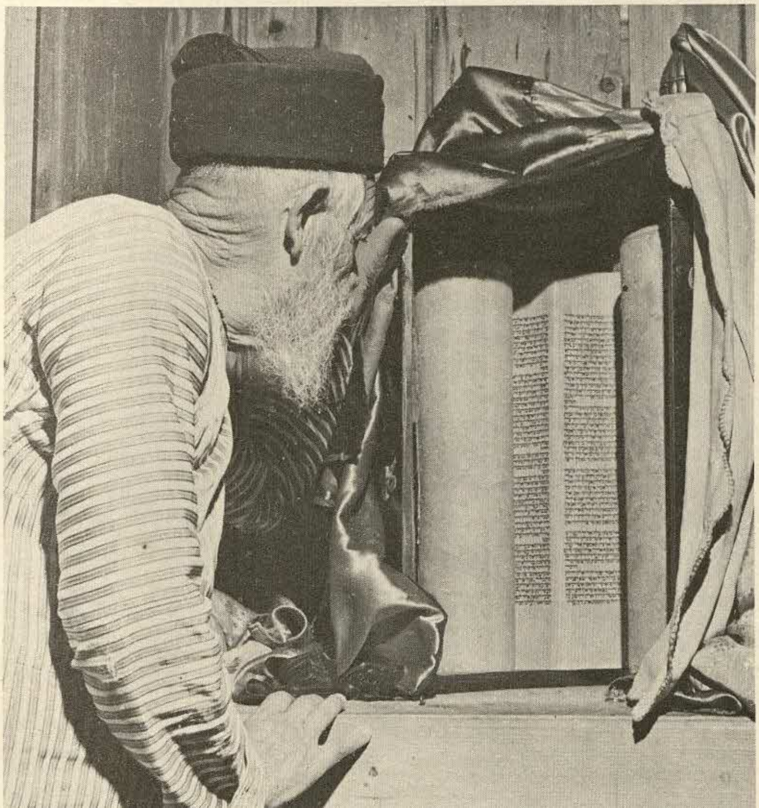
Bible
Bible Stories
Cyrus (The Great)
Hebrew Language and Literature
Israel
Jersualem
Judea
Nebuchadnezzar
Palestine
Semites
Temple
Yiddish
Zionist Movement



Jews were among the first settlers in the Americas. Men who worshiped in this synagogue, built in 1763 at Newport, R.I., fought for the colonies in the Revolutionary War. Named the Touro Synagogue after its first rabbi, Isaac Touro, it is the oldest synagogue building in the United States, and a National Historic Site.

Authenticated News

Jewish Traditions Are Rooted in the Old World and the New



In his ancient land, reborn as the modern State of Israel, a scholar of the Talmud examines a timeworn scroll enshrined in the city of Tiberias. The 63 books of the Talmud set forth laws and ethics governing Jewish life and conduct.

George Pickow from Three Lions, Inc.

A boy takes part in the celebration of Passover, the Jewish festival of freedom, which commemorates the exodus of the Jews from bondage in Egypt. Passover comes in spring, near the time of the Christian Easter. The oldest male in the family reads the story of Passover as part of the observance.

Herbert S. Sonnenfeld

Young and Old Relive History in Jewish Holy Days and Festivals

The Hebrew New Year, called *Rosh Hashana*, is among the high holy days of the Jewish faith. It is celebrated on Tishri 1 and 2 by the Jewish calendar, falling in September or October. The Jewish calendar records over 5,700 years of history. A new year starts with the blowing of the traditional ram's horn, or *shofar*.

UPI

JIG′GER, CHIG′GER, or CHIGOE, *chig′o.* These names are applied in the United States to a number of minute scarlet pests usually considered insects, but really belonging to the same class as spiders and mites. They are so small that they are practically never seen except when they are examined with a microscope. They are found on many plants, especially briers and ferns, and from the plants come into contact with man. They immediately burrow into the skin and cause great irritation and some swelling.

Applications of kerosene or of five-percent carbolized oil will kill them. Bathing in salt, soda, or ammonia water, or sponging the skin with alcohol shortly after exposure to these mites, is said to prevent the injury, and those who anticipate tramping through fields and undergrowth should wear high-top shoes and dust the hose with flowers of sulphur, which will repel the mites.

JINRIKISHA, *jin rik′ e shah.* One of the familiar sights of the Orient is the bouncing jinrikisha, once the chief mode of transportation in Japan, China, and parts of India. It is particularly useful in the crowded streets of cities because it is light and can be easily handled. A two-wheeled carriage with a hood, the "riksha" has two long shafts connected with a crossbar by which a man pulls the vehicle. The puller, or *hiki,* has tremendous stamina and can pull a load at a steady pace for long distances. To carry heavy loads, cords are attached to the crossbar to allow more than one hiki to pull the vehicle.

JIUJITSU, *joo jit′ soo.* See JUJUTSU.

JOAN, *jo an′,* **OF ARC,** SAINT, called THE MAID OF ORLEANS (1412-1431). Of all the women in history who have influenced the course of nations, none compares with Joan of Arc, the saintly, inspired peasant maid who turned soldier to save France.

Jeanne d'Arc, as her name appears in French, was born in the little peasant town of Domremy at the time when the English possessed most of France. As a child she was imbued with the spirit to help her country; but it was not until 1428, when the English were besieging Orleans, that she knew what to do. At that time, she said she had had visions which singled her out as the savior of France. When she went to King Charles and his court to tell them of her dreams, she was thought to be insane, for it seemed preposterous that a girl of seventeen could do anything to save the city, much less the disunited nation.

THE VISION OF SAINT JOAN

The young French peasant girl believed the angels told her she must save her countrymen.

But Joan prevailed upon the king, and finally she was allowed to ride out at the head of the army toward Orleans. She was an inspiring sight for the war-weary men. Clad in shining armor with her long locks falling over her shoulders, she held aloft the banner of France and a gleaming sword. She was successful in her first battles. In

UNDER A CONSECRATED BANNER

Joan of Arc was the girl knight of medieval France. Greatest of her deeds was the raising of the English siege of Orleans (left). Her banner was given by the Church (above).

May, 1429, the English were driven from the siege of Orleans, and the city hailed her as its deliverer. Later, Charles could enter Reims and be crowned king of France, with Joan at his side. But the English still held a large part of France, including Paris, and Joan next launched an attack on that city. Here, she was unsuccessful, but in spite of a wound, she fought on. Finally, in May, 1430, she was captured by the Burgundians, who hated Charles, and they sold her to the British.

Brought to Rouen, which was also in the hands of the English, Joan was given a trial by the English, who feared her power over the French people. The first verdict of the ecclesiastical court which tried her was that she was a sorceress and thus should be put to death. Later, however, her sentence was reduced to life imprisonment. But the English felt that as long as

FIERY DEATH FOR THE INNOCENT HEROINE OF FRANCE

Joan of Arc was an inspiration to the French; so when the English captured her they accused her of heresy because she claimed to be God's messenger. She was burned alive.

she was alive, she was a danger to them; so, on May 30, 1431, Joan of Arc was burned in the streets of Rouen in a fire that blazed her name through history.

Putting her to death was a mistake of the English. She had united the French, and her name surged through the land as a symbol of courage and bravery. When the French heard of her death, they vowed vengeance and fought with increased zeal. The result was that in 1453 the English were practically driven from French soil, and there arose a united French nation, with its foundations in the ashes of Joan of Arc's funeral pyre.

In 1456, despite the cruel trial that had condemned her, Joan was cleared of all charges by the Church, and 453 years later, in 1909, she was beatified by Pope Pius X. She was created a saint in 1919, and today is one of the most revered in the Roman Catholic Church.

JOB, *jobe.* Job's submission to the will of God and his patient acceptance of misfortunes as a demonstration of his faith in God are told in the *Book of Job* in the Old Testament. The book seems to have been designed to make men aware of God's providence and benefits as well as to show that faith in God's will is necessary to a good life. It consists mainly of conversations between Job and his four friends, who accuse him of wickedness and hypocrisy as the cause of his misfortunes, while Job defends himself on the ground that he must submit to God.

JOHN, called THE BAPTIST. Heralding the coming of the Kingdom of God in the person of Christ, John the Baptist was born in Judea six months before Christ. He lived the life of a hermit in the wilderness until about A. D. 26. John then went among the people and preached of the coming of the Messiah. At the baptism of Christ in the Jordan River, John again proclaimed Christ as the Son of God and the Savior of mankind. He was beheaded at the order of Herod Antipas of Galilee, to gratify Herod's wife, Herodias.

JOHN. Of the twenty-three Popes named John, the following were especially prominent.

John I, Pope from 523 to 526, made an unsuccessful attempt to ease the penalties placed on the Arian heretics by Justin, emperor of Constantinople. For his failure, John was imprisoned.

John II, Pope from 955 to 964, changed his name from Octavian to John upon becoming Pope. It was he who, in 962, crowned Otho the Great of Germany, Holy Roman Emperor.

John XXII became involved in a quarrel with Louis IV over the imperial throne, but was later forced to agree to the emperor's views. Pope from 1316 to 1334, John was one of the Popes who resided at Avignon, France. He raised huge sums for the Church and was active in spreading the faith.

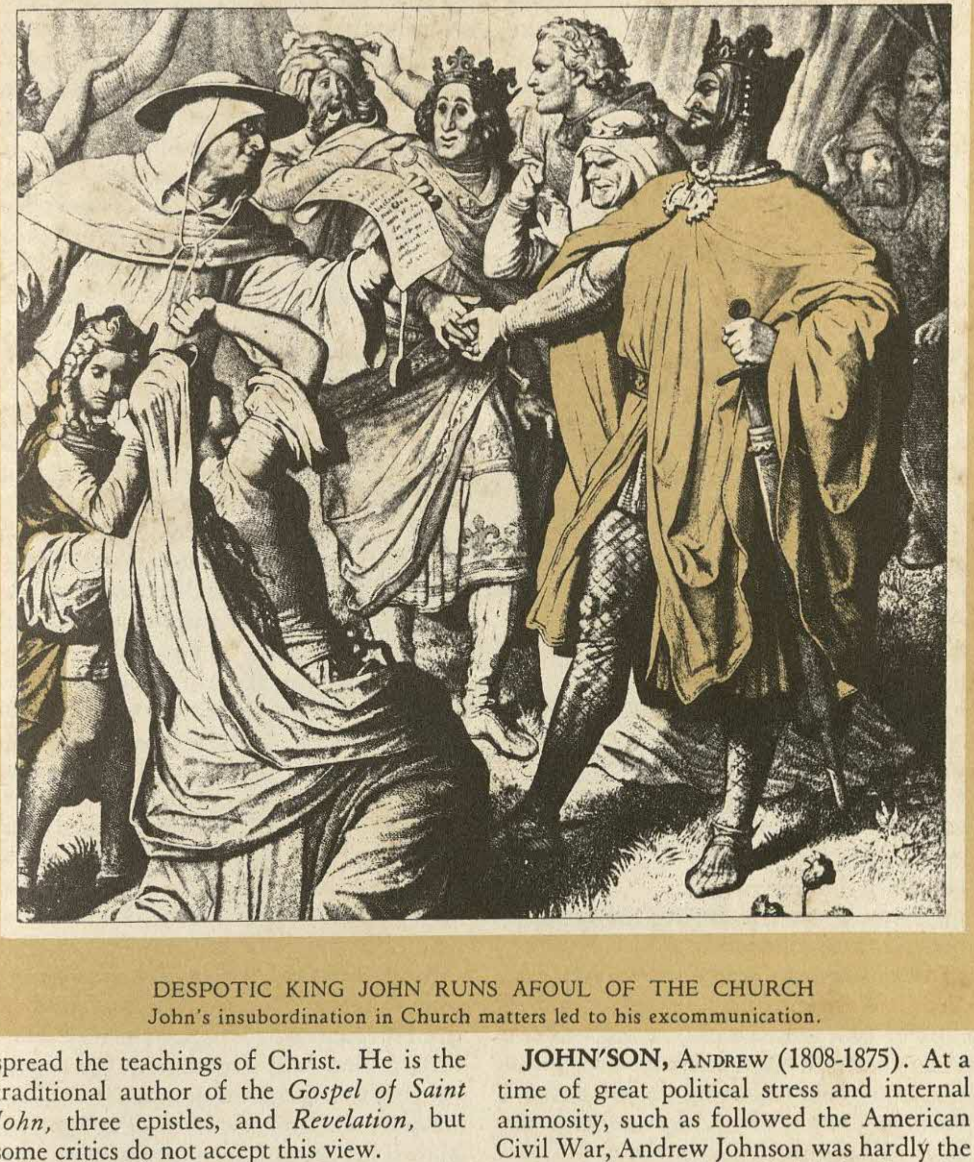
John XXIII (1881-) was elected pope in 1958, succeeding Pius XII. Born Angelo Giuseppe Roncalli at Bergamo, Italy, he was ordained a priest in 1904. He was a chaplain in World War I. He reorganized the Society for the Propagation of the Faith, and served later as Vatican emissary to Bulgaria, Greece, Turkey, and France. In 1953 he became cardinal and Patriarch of Venice. The first John XXIII (1410-1415) is considered an antipope. See ROMAN CATHOLIC CHURCH (with full-color picture of Pope John XXIII).

JOHN (1167-1216), King of England, was the youngest son of Henry II. He succeeded his brother, Richard I, to the throne in 1199. During his stormy reign the Magna Charta was granted.

In 1207 Pope Innocent III named Stephen Langton the Archbishop of Canterbury, a choice which John opposed. The Pope finally put the whole kingdom under an interdict, which forbade the holding of public religious services. Later, Innocent excommunicated and deposed John, asking Philip of France to see that the order was carried out. Pressure from his subjects forced John to submit to the Pope, and he even agreed to recognize the Pope as the superior ruler in England. This action, which placed the country under the Pope's control, angered John's nobles, who in 1215 forced him to sign the Magna Charta.

John retaliated by refusing to recognize the charter, obtaining a Papal bull annulling it and organizing an army to make war on the barons. Unable to defend themselves, the nobles offered the crown to Prince Louis of France, who arrived in 1216 and was acclaimed king. During the struggle that followed, John died. He was succeeded by his son, Henry III. See MAGNA CHARTA.

JOHN, SAINT. Perhaps closer to Jesus than any of the other apostles except Peter, John was a zealous, lovable follower of the Master. He was the son of Zebedee and Salome, and the brother of the apostle James. The two brothers first met Jesus in Galilee and gave up their work to follow Him. They formed, with Peter, that inner circle of disciples most intimate with Jesus. After the crucifixion, John did much to



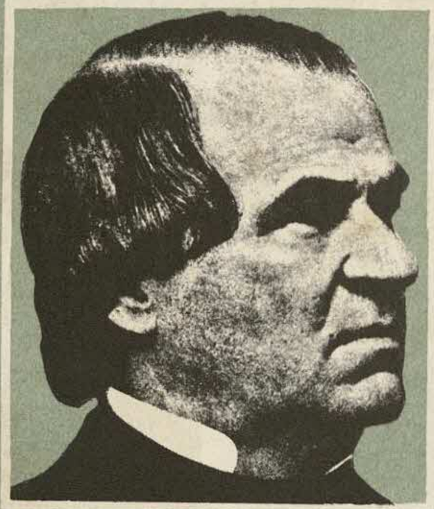
DESPOTIC KING JOHN RUNS AFOUL OF THE CHURCH
John's insubordination in Church matters led to his excommunication.

spread the teachings of Christ. He is the traditional author of the *Gospel of Saint John,* three epistles, and *Revelation,* but some critics do not accept this view.

JOHN BULL. Comparable to "Uncle Sam" of the United States, "John Bull" is a term and figure used to signify the English nation and people. Stout John Bull, with his tall hat, swallow-tailed coat, and the British flag across his chest, first appeared in Arbuthnot's satirical *History of John Bull.* The figure appears most frequently in newspaper cartoons as a symbol for England.

JOHN'SON, Andrew (1808-1875). At a time of great political stress and internal animosity, such as followed the American Civil War, Andrew Johnson was hardly the man to take up the task left by Lincoln. Tact, clear-headedness, leadership, and administrative ability are qualities badly needed in a national crisis, but Johnson had none of these qualities. The preservation and reconstruction of a torn, unhappy country would have taxed even the energy of a man like Lincoln, yet to Johnson's credit it must be said that by sheer, blunt force and will to do what he thought was right, he stemmed the tide of unrest and hate which threatened to destroy what the war had sought to preserve—peace and unity. Elected in 1864 as Vice-President simply as a token of appreciation to loyal Southern Democrats, he was not thought of as likely to become the seventeenth President of the United States.

Soon after his inauguration, his popularity, based on patriotic enthusiasm, waned, and Johnson became the first President of the United States to be impeached. Freed of the charges — justly, observers are inclined to agree—the President succeeded in preserving the independence of the executive department, an accomplishment which has since accounted, to a great degree, for the stability of the American form of government.



ANDREW JOHNSON
Seventeenth President of the United States
Administration: 1865-1869
Johnson reached the White House via the Vice-Presidency, when Lincoln was shot. He was the only President ever to face impeachment trial.

Early Career. Andrew Johnson was born at Raleigh, N. C., son of common folk. When Johnson was four years old, his father died. At ten, he became an apprentice to a tailor. Moving to Greeneville, Tenn., a youth of eighteen, the future statesman opened his own shop and married a girl who undertook to share her education with her husband. From her, Johnson received his schooling.

As alderman, elected by a workingmen's party organized by himself, the struggling young tailor entered politics. He progressed to mayor, state representative, and state senator. Finally he was elected to the House of Representatives. In 1853 he was elected governor of Tennessee, and four years later was sent to the United States Senate.

In the Senate, Johnson stood almost alone among the Southern bloc for preservation of the Union. Although favoring retention of slavery as it then existed, he refused to let that sway his patriotism and openly accused the secessionists of treason. In 1861, without a seat in the Senate, he returned to Tennessee, and the year following was appointed military governor of the state by Lincoln.

Although he was a Democrat, the Northern Republicans recognized the value of loyal Southerners, and Johnson was teamed with Lincoln on a compromise ticket in 1864. A year later, this Southern Democrat holding Union sympathies sat in the White House through the death of Lincoln.

As President. At first, Johnson agreed with Congress that the South should be severely punished, but Secretary of State Seward forced the President to face reality —that only wise reconstruction would accomplish the desired results. Perhaps, too, it was the magnitude of the office that caused the harsh, hasty attitude to be tempered.

Johnson's first major step was to declare a general amnesty (with certain exceptions) for the South, and to establish provisional congresses in several states. Before the Federal Congress had convened, Johnson had set in motion the machinery of reconstruction which little pleased the legislators who had long toyed with ideas of severe measures and penalties. The gap between the President and Congress continued to widen, the President vetoing bills passed by Congress and Congress retaliating by pasing them over the vetoes. The growing antagonism exploded when the President demanded that Edward M. Stanton, Secretary of War, resign. The Senate refused to agree to the removal, and Johnson refused to reconsider. As a result, the President was called to trial for charges of violating the Tenure of Office Act in removing Stanton, and for insulting Congress. The trial was long and bitter. Lacking only one vote necessary for conviction, the Chief Executive was acquitted.

Other events of importance during the administration were the purchase of Alaska from Russia in 1867 for $7,200,000; the laying of the Atlantic cable in 1865; the passage of the Thirteenth and Fourteenth amendments, forbidding slavery and granting equal rights to all citizens; and the admission of Nebraska to the Union.

Later Years. A man now without a party, lacking Northern support and unpopular in the nation's capital, Johnson was not renominated. But in 1875 he again became a member of the Senate. In the same year he died and was buried at Greeneville. See IMPEACHMENT; RECONSTRUCTION.

JOHN'STON, ALBERT SIDNEY (1803-1862). An outstanding soldier in the struggle for Texas independence and later in the Confederate Army, Albert Johnston had a brilliant record when he fell at the Battle of Shiloh in 1862.

He was born at Washington, Ky., was educated at West Point, and received his first taste of military experience in the Black Hawk War. In 1834 he resigned his commission and went to Texas. Joining the army there, he soon became commander. He served for a time as Secretary of War in the new republic, later resigning to become a planter.

He entered the service of Texas again at the outbreak of the Mexican War and was made an officer in the United States Army at its close. Leading an expedition against the Mormons in 1857, he received recognition for his tactful negotiations with the leaders of that religious sect. Although he had been elevated to the rank of brigadier general, Johnston, at the outbreak of the Civil War, cast his lot with the South and was given charge of the forces in the West. During the first year of the war he made an excellent showing in the defense of Kentucky and Tennessee. While leading a courageous charge at Shiloh, he met his death.

GENERAL JOSEPH E. JOHNSTON
One of the Confederacy's greatest strategists.

JOHNSTON, JOSEPH EGGLESTON (1807-1891). Hero of the Battle of Kenesaw Mountain, Joseph Johnston was one of the most brilliant of the Confederate generals during the American Civil War.

Johnston was born near Farmville, Va., and graduated from West Point in 1829, a classmate of Robert E. Lee. After serving in the Black Hawk and Seminole wars, he withdrew from the army to become a civil engineer. Later he entered the engineering corps of the army, becoming captain in 1846. Johnston was called to service in the Mexican War, and was wounded at the Battle of Cerro Gordo, receiving the rank of colonel for his bravery. This post was raised to lieutenant colonel after the gallantry shown at the Battle of

Chapultepec. The year before the outbreak of the Civil War, he was made quartermaster general with the rank of brigadier general. At the outbreak of the war, he resigned and joined the Confederate Army.

After his victory in the first Battle of Bull Run, he became a full general and was, for a time, in command of the Confederate forces in Virginia. He was succeeded by General Lee after suffering a wound at Fair Oaks. Later, as commander of the forces of Tennessee, Johnston sought to save Vicksburg but was defeated by Grant at Jackson. As a reward for his outstanding service at Chattanooga, the command of the forces in the Southwest was given him. He commanded a masterly retreat before the army of General Sherman, then on its march to Atlanta.

Despite Johnston's fine record up to this time General Hood was sent to replace him. However, he had gained favor with General Lee and was soon given the task of stopping Sherman's march northward from Atlanta; but after he was defeated at several points, his surrender on April 26, 1865, was inevitable.

For several years after the war, Johnston was engaged in private business in the South. In 1876 Virginia elected him to Congress. In 1887 he was appointed United States Commissioner of Railroads by President Cleveland.

JOINTS. Connecting bones and permitting the various parts of the body to move freely, the joints are of two general types, the *immovable* and the *movable.*

There are four kinds of movable joints. The *ball and socket,* at each shoulder and hip, consist of a rounded end on a long bone fitting into a cavity in the other bone. It is held in place with strong ligaments and muscles.

Hinge joints allow movement in two directions, backward and forward in one plane. They are found in the elbow, knee, fingers, and toes.

When one bone rotates upon another, the articulation is called a *pivot* joint, such as occurs between the first and second cervical vertebrae of the backbone. This type of joint allows the head to be turned. A modified form of the pivot joint at the elbow permits the hand to be turned independently of the upper arm and shoulder.

Gliding joints, found in the wrist and ankle, consist of bones which slide slightly when weight is applied to the hand or foot.

The ends of the bones in movable joints are covered with a smooth cartilage kept moist by a fluid called *synovia.*

The immovable joints are located between some of the bones of the skull and of the face. In the skull these joints protect the brain because they will "give" slightly when struck, thus tending to prevent fracture. See BONE; SKELETON.

JOLIET, *zho lya',* LOUIS (1645-1700). Although De Soto is given credit for the discovery of the Mississippi, it was not until the time of Joliet, more than 125 years later, that the world learned the real secret of that vast river. Born in Quebec, Louis Joliet studied for the priesthood at the Jesuit College there. His love of nature proved to be a stronger influence, however, and he became famed as a trapper, explorer, and voyageur.

In 1672 he was selected by Frontenac, governor of Canada, to explore the course of the Mississippi. Accompanied by Father Marquette and five stalwart companions, he set out the following year in two canoes. Starting from Green Bay, the party paddled up the Fox River, made a portage to the Wisconsin River, and so reached the Mississippi. After exploring the upper stretches of the great river, the party turned southward and paddled downstream past the turbulent mouth of the Ohio, on past the muddy outlet of the Missouri, and as far south as the Arkansas. Here they turned back, realizing that the river continued southward, emptying not into the Pacific, but into the Gulf of Mexico. So, although the discovery was of great significance, the search for a water route through the country to the Pacific was still not at an end.

On his return trip, Joliet paddled up the

FIRST TO FOLLOW THE FATHER OF WATERS
Joliet and Father Marquette proved the Mississippi ran to the Gulf of Mexico.

Mississippi to the Illinois River, thence to the Chicago River and into Lake Michigan. While he was continuing his return trip down the Saint Lawrence, his canoe capsized in the Lachine Rapids, and all his maps and records were lost. Undismayed, he rewrote his account of the voyage from memory, presented it to the governor, and as a reward was given the island of Anticosti, where he built a fort. In 1693 he was appointed Royal Hydrographer of New France, and four years later was given a grant of land near Quebec, which is still in the possession of his descendants.

JO'NAH. According to the Old Testament *Book of Jonah,* God sent the minor prophet, Jonah, to tell the people of Nineveh their city was doomed because they had sinned. Unwilling to go, Jonah boarded a ship for Tarshish. During a storm, he was cast into the sea and swallowed by a whale. After three days and nights the whale spewed him onto the shore. He delivered his message to Nineveh, which repented and was saved.

JON'ATHAN. The son of Saul, Israel's first king, Jonathan was the devoted friend of David. Often cited as an example of ideal friendship, the love of David and Jonathan makes one of the Bible's most beautiful stories. See BIBLE STORIES.

JONES, JOHN PAUL (1747-1792). No chronicle of America's struggle for independence can omit the stirring contribution of John Paul Jones, the most famous naval commander in the Revolutionary War. The victory of his ship, the *Bon*

BON HOMME RICHARD'S HERO
John Paul Jones, America's great sea fighter.

Homme Richard, over the English sloop *Serapis* on September 23, 1779, off the British Isles, aided greatly in bringing prestige to the American navy.

He was born in Kirkcudbrightshire, Scotland, and his real name was John Paul. The "Jones" was added for an unknown reason when he came to Virginia in 1773. Two years later, when the war broke out, he offered his services to the colonies and set about plundering English ships and threatening English coastal towns. His campaign was climaxed by the battle between the *Serapis* and the *Bon Homme Richard,* and after that he fought no more. See BON HOMME RICHARD.

When Jones returned to America, he expected to be rewarded richly. Upon the failure of the Continental Congress to meet his expectations, he left the country to become a rear admiral in the Russian navy. But he was the object of jealousy, and he soon retired. He then went to Paris, where he died in 1792.

In 1905, after a long search, his remains were recovered and brought back to Annapolis. He was buried on the grounds of the United States Naval Academy.

JON'QUIL. Few flowers surpass the lovely yellow jonquil in simple, unassuming beauty. Distantly related to the daffodil, the jonquil is a species of narcissus with fragrant flowers, long, crisp, leafless stems, and slender, rushlike leaves. Commercially it is used in making extracts and toilet waters.

JON'SON, BEN, or BENJAMIN (1573-1637). Second only to Shakespeare in English literature of the Elizabethan Age is "rare Ben Jonson," friend of the "Bard of Avon." As is the case with many other writers of his time, the facts of Jonson's early life are vague. He was probably born at Westminster and attended school there for a time. Later he joined the army, serving in Holland.

Upon his return to England he took up theatrical life. In those days playwrights were also actors, and both he and Shakespeare performed on the stage. In 1598, for instance, when Jonson produced his first play, *Every Man in His Humour,* Shakespeare was one of the actors. A year later, after Jonson had been imprisoned for killing a man in a duel, he wrote *Every Man Out of His Humour,* and later wrote *Cynthia's Revels, The Poetaster, Sejanus, Volpone, Epicoene, or the Silent Woman,* and *Catiline.*

Becoming poet laureate in 1619, Jonson usually spent his pension at the Mermaid or other taverns, where men of the theater and letters gathered for convivial purposes. His comedies and tragedies are considered excellent in plot and characters, but it is in his poems and songs that his ability as a lyrical poet is evident. Probably the best known of his ballads is *Drink to Me Only with Thine Eyes,* popular to this day.

JOP'PA. See JAFFA.

JOR'DAN, HASHEMITE KINGDOM OF. See TRANSJORDAN.

JOR'DAN. Because of its size and its Biblical background, the Jordan is the most important river in the Holy Land. Rising in the southern part of Syria just west of Mount Hermon, the river follows an erratic course southward through Lake Huleh and the Sea of Galilee, emptying into the Dead Sea about thirty miles east of Jerusalem. Its course covers about 200 miles, although from source to mouth its air-line distance is but sixty-five miles.

Beginning at an altitude of 700 feet, the river drops rapidly, falling fully sixty-nine feet per mile, between Lake Huleh and the Sea of Galilee. Between the Sea of Galilee and the Dead Sea, the drop is about nine feet per mile. The Jordan is extremely shallow. Needless to say, it is of little use for navigation. Furthermore, it empties into a sea having no access to world commerce.

The stream flows through the Ghor Valley, varying from one to sixteen miles in width and shut in by ridges from 3,000 to 4,000 feet high. The small valley directly adjacent to the stream is called the Zor and is likewise bounded by ridges. The Zor is but one-half to two miles in width, and

AN IMPERIAL AMBITION ENDS A ROMANCE
Empress Josephine gave him no heir, so Napoleon divorced her; married Austria's Maria.

during the rainy season is covered with grass and small trees. See PALESTINE.

JOSEPH. According to the New Testament, Joseph was the husband of Mary, the mother of Jesus. He is believed to have been a descendant of King David, but was himself a poor carpenter of the village of Nazareth. He probably died before the public ministry of Jesus began.

JOSEPHINE, *zho za feèn',* MARIE ROSE (1763-1814). Although extravagant and not well educated, Marie Rose Josephine, because of her dignity and charm, became empress of the French as the wife of the great Napoleon Bonaparte. She was first married to the Vicomte de Beauharnais; and of this union were born two children, Eugène and Hortense. Her husband fell under suspicion in the Reign of Terror during the French Revolution and was executed, Josephine barely escaping with her life.

Napoleon having fallen madly in love with her, she reluctantly married him in 1796, and her charming manner and friendliness were a great aid in fortifying her husband's position. When Napoleon became emperor in 1804, she was crowned empress.

The marriage was never a happy one, however, for Napoleon had visions of founding a dynasty, and Josephine bore him no children. A divorce came in 1809, and Josephine retired on a pension to a lonely life at Malmaison. Napoleon then married the Archduchess Marie Louise of Austria. Josephine was, however, permitted to retain her title, and was frequently visited by Napoleon, who valued her advice on many matters. See Napoleon I.

JOSH'UA. The great leader of the Israelites after the death of Moses was Joshua, under whom the wandering tribes captured Jericho, marched over the Jordan, and took the Promised Land. Joshua, the son of Nun of the tribe of Ephraim, had been appointed to his commanding position by the aged Moses. It was Joshua who arranged the division of Palestine among the twelve tribes. He died at Timnath-Serah at the age of 110. His life is told in the *Book of Joshua.*

JOURNALISM. See Newspaper.

JUAN FERNANDEZ, *hwahn fer nahn' dath,* **ISLANDS.** Comprising a small group of picturesque and fertile islands about 400 miles off the coast of Chile, the Juan Fernandez Islands were the inspiration for the immortal adventure story, *Robinson Crusoe,* by Defoe. A Scotch sailor, Alexander Selkirk, was once marooned on one of the islands, and Defoe is said to have drawn upon Selkirk's experiences in writing the book.

Once a part of a submerged continent, this group is composed mainly of barren, volcanic rock; but the two principal islands, Mas-a-Tierra and Mas-a-Fuera, have been made into national parks by the Chilean government because of their great natural beauty. Mas-a-Tierra is alternately cut by fertile valleys and jagged mountains, its highest point being the anvil-shaped El Yunque, 3,200 feet above sea level. Its only harbor is Cumberland Bay, and the island is about thirteen miles long and four miles wide.

A high, flat plateau with an altitude of 3,000 feet, Mas-a-Fuera has tall sandalwood trees and giant ferns. Tropical fruits and magnificently colored birds are native to the island, and there are many wild goats, sheep, and pigs, descendants of the animals brought there by Juan Fernandez when he discovered the islands in 1563.

JU'DAH. The fourth son of Jacob was Judah, the forefather of the tribe of Judah. The ancient kingdom of Judah in Southern Palestine was named for him, and the Jewish faith is known as Judaism.

JU'DAS, surnamed Iscariot. When, at the Last Supper, Jesus said: "One of you which eateth with me shall betray me," He meant Judas Iscariot, who only a few hours later delivered the Master into the hands of the high priests. Judas, one of the twelve disciples, betrayed Jesus for thirty pieces of silver. But when he had done so, remorse overcame him; and he took his own life.

JUDE'A. When the Jews returned to Palestine from the Babylonian exile, they called the southern part of the country Judea. The region was bounded on the east by the Dead Sea and the Jordan River, on the north by Samaria, on the west by the Mediterranean, and on the south by Arabia. Bethlehem, where Jesus was born, was a village of Judea. See Palestine.

JUDGE. In any court above a local justice court, headed by a justice of the peace, and below the United States Supreme Court, whose members are Justices, the presiding officer has the title of judge. Qualifications of a judge are learning in the law, balance, poise, and judicial temperament.

In a state one county may comprise a judicial circuit, or several counties may be joined into one circuit; in the latter case one judge presides over the court in each county of his circuit; hence he bears the title circuit judge. He is selected by a majority vote of the people of the county or circuit, and his usual term is six years. In large cities special courts may be authorized to try violations of city ordinances; over these, judges also preside.

In the judicial system of the United States, all justices and judges are appointed by the President for life; the appointments must be confirmed by the Senate. All other judges are elected by popular vote.

In common law, a judge rules on points of law and sees that the jury may decide properly on questions of fact; in equity, he is charged with both decisions. He is not subject to prosecution on the basis of his decisions unless he has acted outside his jurisdiction; he is not supposed to hear cases involving his personal interests. See COURT; LAW.

JUDGES, BOOK OF. The history of Israel under the judges is told in the Old Testament in the *Book of Judges*. This book contains accounts of the conquests by Israel of the neighboring enemies and of the strengthening of the new nation.

JUDICIARY. See COURT.

JUGOSLAVIA, *joo go slah' vi ah*. See YUGOSLAVIA.

JUGULAR, *joo'gu lar,* **VEIN.** One of two large veins on either side of the neck, the jugular vein returns blood to the heart from the head, neck, and face. One pair of these veins lies just under the skin and can be discovered by applying a slight presure of the fingers to the neck. The deeper, internal pair lie near the carotid artery. Severing a jugular vein is serious; a cut in one of the internal veins is usually followed by death.

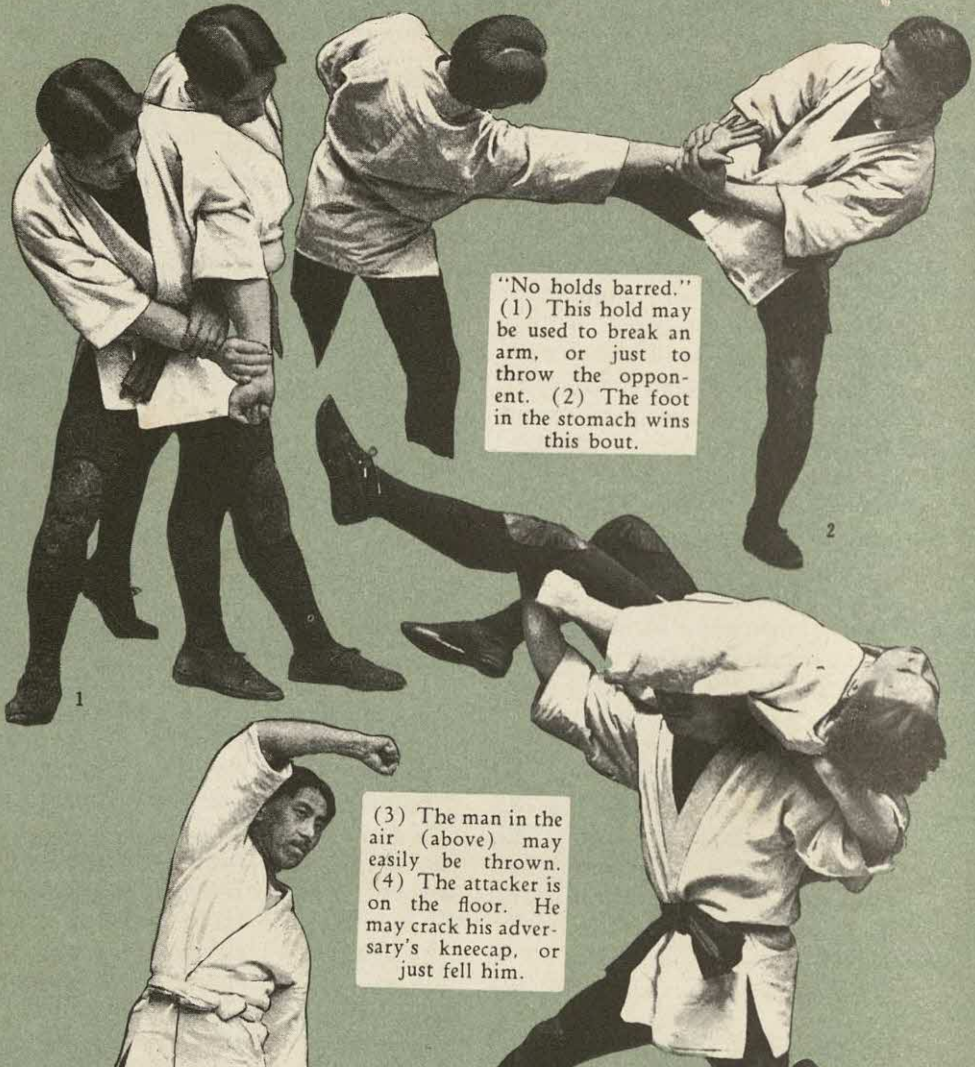
JUJUTSU, *ju jut'soo,* **or JIUJITSU,** *joo jit'soo*. Persons of small size need not feel inferior to stronger and taller men in case of attack if they know jujutsu. For, with this ancient Japanese art of self-defense, they are more than a match for anyone not familiar with its mysteries.

Courtesy A. G. Spalding & Bros.

SCIENTIFIC SELF-DEFENSE
Jujutsu is the art of making one's opponent do the work required to defeat him. Here the victim (left) is held powerless by a simple grip.

Jujutsu, which means *muscle science,* entails a knowledge of vital nerves and muscles in the body. By pinching, striking a sharp blow, or merely applying pressure to a vulnerable place on an opponent's body, it is possible to incapacitate the opponent immediately, and even to cause serious injuries. Such vulnerable places include the "funny bone" at the elbow; the armpit, wrists, ankles, Adam's apple, and the solar plexus.

Jujutsu differs from wrestling in that strength is not necessary. However, one must know how to apply the tricks swiftly and scientifically, and to do so requires considerable training. In Japan, where jujutsu has been practiced for more than 2,000 years, all physical activities begin with the fundamentals of jujutsu. Until comparatively recently, however, the art was jealously guarded by members of the upper classes. The secrets were handed down from generation to generation. It is said that the Japanese adopted jujutsu from the Chinese and improved upon it through the centuries.



"No holds barred." (1) This hold may be used to break an arm, or just to throw the opponent. (2) The foot in the stomach wins this bout.

(3) The man in the air (above) may easily be thrown. (4) The attacker is on the floor. He may crack his adversary's kneecap, or just fell him.

Photos courtesy A. G. Spalding & Bros.

NIPPON'S EFFECTIVE AND DANGEROUS "WRESTLING"

Jujutsu experts hardly ever need to use any great force; they make twists and leverage do all the work. The secret lies in knowing just where to seize the opponent, and in doing it so fast he doesn't see it coming. Though ordinarily not carried to extremes, jujutsu holds usually are capable of inflicting serious injury, sometimes death.

JU'LIAN (Flavius Claudius Julianus) (about 331-363). Among all the Roman emperors, few led lives so active as that of Julian. Born at Constantinople, the nephew of Constantine the Great, he spent his early life in Asia Minor and at Athens. He was reared a Christian and studied literature and philosophy. Eventually he gave up Christianity and became a pagan. His first military activity came when he was placed in command of an army and defeated the Alemanni, the ancient Germanic tribes, driving them beyond the Rhine. He ruled Gaul so wisely that the emperor became jealous and withdrew many of the troops, claiming that he needed them to fight against Persia. This action so angered his soldiers that they declared Julian emperor in 360, even against his wishes. The real emperor, Constantius, prepared to defend his throne but died before much fighting occurred.

Julian then entered Constantinople as emperor and immediately began to restore paganism. He refused, however, to persecute the Christians. But because he renounced Christianity, he has often been called "Julian the Apostate." He invaded Persia in 363, captured several cities, and lost his life in one of the battles of the campaign.

JULIAN CALENDAR. See Calendar.

JULIUS. Three Popes have borne the name of Julius:

Julius I, a saint, was Pope from 337 to 352. He gained recognition for his opposition to the Arian heretical doctrines, as formulated by Arius. Arius believed that Christ was of like substance with the Father, but was the first of creation. The orthodox doctrine, which Julius defended, was that the Son is the same essence as the Father. The feast day of Julius is April 12.

Julius II, Pope from 1503 to 1513, was a warrior and one of the strongest of the Popes. He restored the Papal States and removed foreign rule from Italy. For a time he took part in the League of Cambrai with Emperor Maximilian, Louis XII, and Ferdinand of Aragon. He withdrew from

POPE JULIUS II VISITS A CELEBRATED CONTEMPORARY

Much interested in the progress of art, Pope Julius was a patron of Michelangelo, one of the greatest sculptors who ever lived. They met in the artist's studio.

that league after sharing in its benefits and formed the Holy League, which gave the Papacy control of Italy by breaking the power of the French.

Julius III was Pope from 1550 to 1555. While still a cardinal, he was one of the representatives of the Church at the Council of Trent. As Pope, he reconvened the Council, in 1551. At first an enemy of Emperor Charles V, he was reconciled with that powerful ruler after becoming Pope.

JULY. Coming in the midst of summer, when gardens and fields are rich with glory, July is a month of clear skies and brilliant sunshine. In the latter part of the month, there is a hint of approaching autumn, for the grass begins to fade and the leaves to droop and curl.

July, with its thirty-one days, has not always been the seventh month in the year. In the Roman calendar it was fifth and bore the name of *Quintilis*. The name was changed to July in honor of Julius Caesar, who was born on the twelfth day of the month.

JULY REVOLUTION. An echo of the French Revolution of 1789-1799 was sounded in Paris in July, 1830, when the French people rebelled against being deprived of their rights. The king, Charles X, was a believer in the old regime, and gradually sought to bring back autocratic rule. In 1830 his ministry announced that freedom of the press would no longer be tolerated and other rights would be taken from the people. Immediately the people rose, and in a short revolution, confined to Paris, swept Charles out of power and placed Louis Philippe on the throne. See CHARLES X.

JUNCO, *jun'ko,* **or SNOWBIRD.** Often during the winter months, flocks of small gray juncos, or snowbirds, are seen about fields, hedgerows, and dooryards busily feeding on weed seeds. They belong to the finch family and are about the size of sparrows. The backs and throats of these birds are a slaty-gray color, changing suddenly to white on the underparts, and the outer feathers of the tail are white, showing plainly in flight. They readily respond to feeding and will visit a window shelf regularly all winter long, if it is kept well supplied with crumbs and cracked grain.

THE SLATE-COLORED JUNCO
He stays in the snowy North during the winter.

The best-known species is the *slate-colored* junco of the Eastern states and Canada. It nests in deep, shady swamps and woods and in pastures or clearings in northern regions and in the southern mountains, building a nest on the ground, hidden by grass, logs, or brush.

JUNE. In the words of the poet Lowell,

And what is so rare as a day in June?
Then, if ever, come perfect days.

Lush, warm greenness, singing birds, brilliant sapphire skies, warm, romantic nights, lazy, indolent days—those are the perfect features that have endeared June to the hearts of everyone. June is famous as the month of graduates and brides and roses.

Like other months, June has undergone many changes. Originally it had but twenty-six days, to which Romulus is supposed to have added four. When Numa Pompilius came to the throne, he reduced the days to twenty-nine. The month was restored to thirty days by Julius Caesar. Much uncertainty exists as to how June got its name. Some maintain that it was named for Juno, queen of the gods. The most probable explanation, however, is that it came from *iuniores,* meaning *younger men,* just as May was named for *maiores,* or *older men.*

JUNE'BERRY. Just about the time the shad begin to run up the rivers in the spring to lay their eggs, the Juneberry, often called the *shadbush,* bursts into blossom. It is also often termed *serviceberry* and *May cherry.*

There are about twenty-five species of the Juneberry, all members of the rose family. They are usually shrublike in size, although one species found from Newfoundland to Florida and west to Kansas is a tree sometimes growing forty feet high, with a two-foot trunk. The leaves of the Juneberry are simple; the flowers are white and grow in clusters. The fruit of the plant, often eaten, is a soft, juicy berry about the size of a pea. It is purplish in color.

JUNE BUG, or MAY BEETLE. Throughout the warm nights of May and June the air is filled with clumsy, blundering June bugs buzzing their leisurely way to the nearest light. But that they annoyingly bang against your head, or get into the house, or rat-a-tat against the screen is not their greatest fault. They feed upon young leaves and fruit and, worst of all, lay their eggs in the ground, where they hatch out as fat, white grubs which feed upon the roots of plants and cause the plants to wither and die.

JUNGFRAU, *yoong'frou.* No mountain peak in Europe is better known to the world's mountain climbers than is beautiful Jungfrau in the Swiss Alps. Located about twelve miles southeast of Interlaken, its beautiful, snow-capped peak reaches a height of 13,671 feet. From its slender form and the purity of its brilliant white snow, it gets its name of Jungfrau, meaning *maiden.*

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SNOW-CROWNED "YOUNG WOMAN" OF THE SWISS ALPS

The *Jungfrau* is one of the most beautiful peaks in this mountainous country. Below it lie Alpine farms and the lovely town of Interlaken. Many mountain climbers have scaled the Jungfrau's sparkling heights, but the climb is still a challenge to the hardiest sportsman.

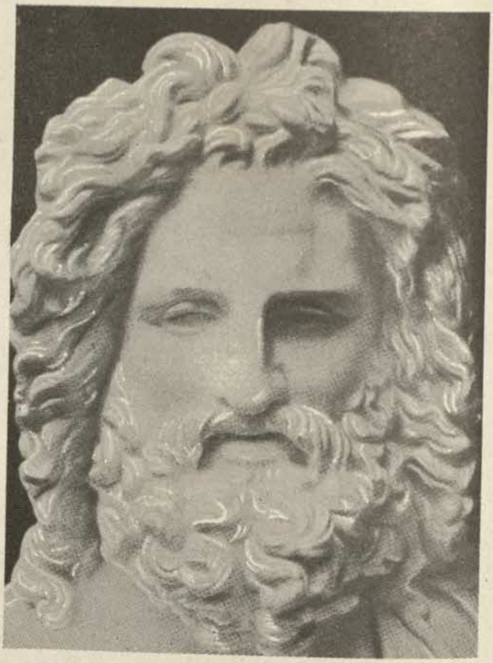
On the east and north its slopes are almost perpendicular, but the other sides are less steep, giving relatively easy access to mountain climbers. The Jungfrau was first scaled by two Swiss brothers in 1811; since that time many tourists have toiled to its summit. In recent years an electric railway has been built up the slope. The last five miles of the railway are through a tunnel at an elevation of 11,340 feet, the last part of the ascent being made by elevators.

JU'NIPER. Well known because of its peculiar berries, the juniper tree is a member of the cone-bearing family. There are about forty species of junipers, all of which grow in the Northern Hemisphere. The leaves of the *common* juniper are long, spreading needles, but in some other species the foliage appears as small, overlapping, green scales. The common juniper never exceeds thirty feet in height; more often, it is a shrub of less than six feet. The fleshy cones contain from one to twelve seeds and form the juniper "berry," so-called because of its resemblance to a true berry. From these cones comes a valuable oil, used in medicine and in flavoring gin. The wood of the juniper is brownish red, hard, and of pleasant aroma. The North American *red cedar* is a juniper.

JU'NO. The greatest of Roman goddesses and the wife of the chief deity, Jupiter, was Juno, queen of heaven and earth. In Grecian mythology she is called Hera. She is supposed to have been an extremely jealous wife, ever watchful of her husband. Her special charges were women and marriage, and prayers were offered to her by all Roman women. The peacock was sacred to her.

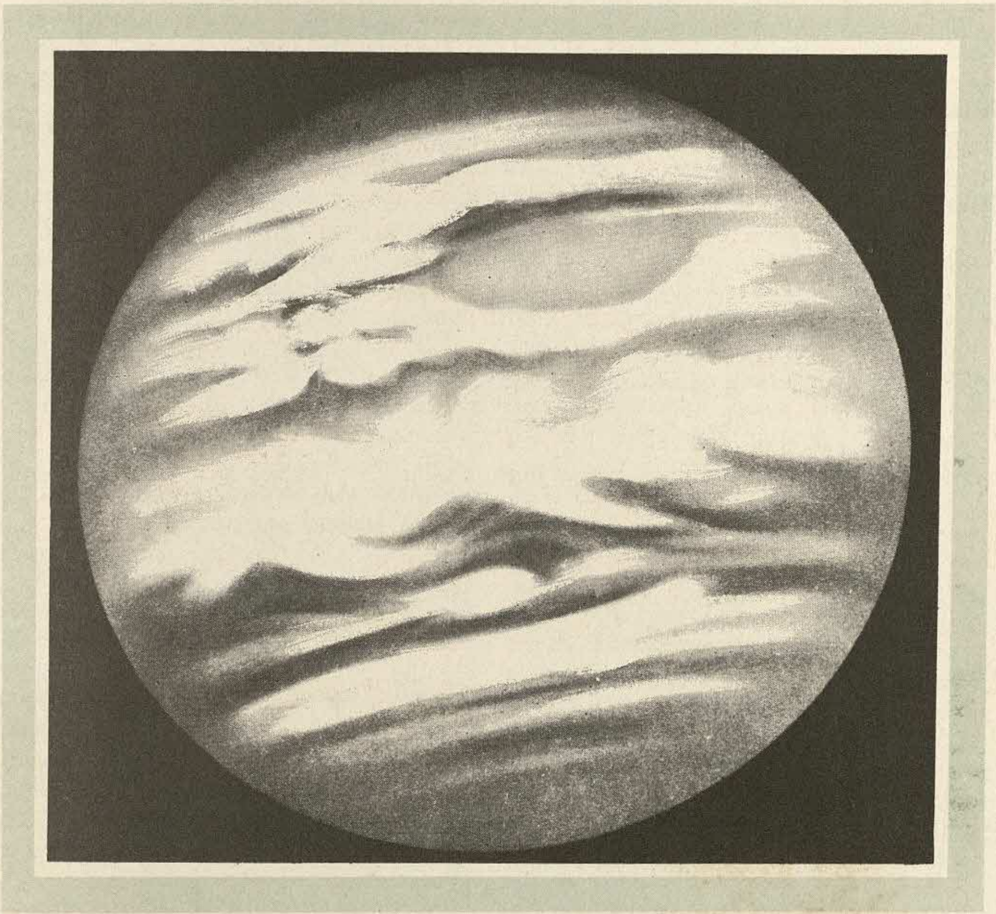
JUP'ITER. With a volume more than 1,300 times as great as that of the earth, Jupiter is the largest of the planets. Its diameter is eleven times that of the earth, being 88,000 miles. Fifth among the planets in distance, Jupiter is, on the average, 483,000,000 miles from the sun. It rotates the most rapidly of all the planets, its period of rotation, or *day,* being less than ten hours, while its period of revolution, or *year,* is equal in length to almost twelve of our years. Twelve satellites, or moons, revolve about Jupiter, four of which are so large and bright as to be almost visible to the naked eye. Oddly enough, eight of the moons revolve in a clockwise direction, while the other four revolve in a counterclockwise direction.

Unlike the smaller planets, Jupiter is thought to be largely gaseous; at least its exterior is. The material making up the planet is very light, only one fourth as heavy as an equal volume of earth materials. However, its immense size makes the pull of gravity on its surface over two and one half times that existing on the earth. If a twelve-year-old boy weighing 100 pounds on earth were transported to Jupiter, he would be only slightly over one year old, measured by its years, and over 250 pounds in weight. See ASTRONOMY; PLANET; SOLAR SYSTEM.



JUPITER, KING OF ROMAN GODS

JUPITER, or JOVE. All-powerful, thundering Jupiter was the greatest of the Roman gods. Known as Zeus in Greek legends, Jupiter was the son of Saturn and



JUPITER, MYSTERIOUS GIANT OF THE SOLAR SYSTEM
Largest of the planets, Jupiter is not solid like the earth, but still nebulous; must wait millions of years to harden. Its surface shows a strange red spot (oval, upper right), which astronomers cannot explain. Jupiter is 1,300 times the earth's size.

Rhea. When Saturn was overthrown, according to mythology, Jupiter received heaven and earth as his share of the universe; Neptune got the sea, Pluto the underworld. Jupiter's first wife was Metis, but his favorite was Juno, whose jealousy followed him everywhere. Jupiter had many mortal wives, including Danae, Europa, and Io, and among his children were the Fates, the Graces, and the Muses. Roman artists pictured him as an impressive, middle-aged figure with a full beard. The eagle was sacred to him.

JU'RY AND TRIAL BY JURY. One of the fundamental rights of a free people is that of trial by jury. It is one of the rights which the English nobles wrung from King John when they forced him to sign the Magna Charta in 1215. It is included in the Bill of Rights of the Constitution of the United States, in the Fifth, Sixth, and Seventh amendments:

"No person shall be held to answer for a capital or otherwise infamous crime, unless on a presentment or indictment of a grand jury." "In all criminal prosecutions the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed." "In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved."

The Grand Jury. Two kinds of juries have a part in criminal trials today—the grand jury and the petit jury. The grand jury may have from twelve to twenty-three members, although twenty-three is the usual number. The members are chosen by lot from a list of those eligible for jury service. The duty of the grand jury is to decide, usually in secret meetings, whether or not the charge, or indictment, against the accused has a basis of fact. The accused person is not present. If a majority of the jury believe that the charge is justified, a true bill is returned and the accused is indicted for trial. Otherwise the accused is dismissed.

The Petit Jury. Twelve persons constitute the petit jury. This kind of jury tries civil cases and also criminal cases from the grand jury. Attorneys for either side have the right to challenge the right of anyone to sit on the jury. In a murder case the jurymen are usually kept in the custody of the sheriff or his deputies and are not permitted to discuss the case except among themselves until after they have rendered their verdict and been dismissed by the court. After the jury has heard all the evidence, the judge gives his instructions on the points of law, after which the jury retires to consider a verdict. Usually a unanimous verdict is necessary. If the jury cannot agree, it is discharged, and the case is then tried by another jury.

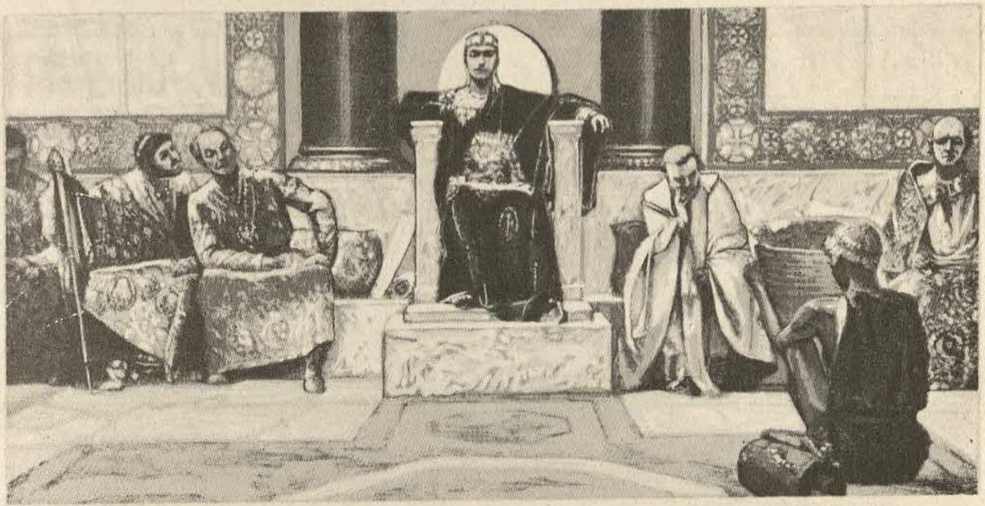
The Coroner's Jury. Cases of sudden or violent death are investigated by the coroner's jury. The duty of this jury is to determine the cause of death and to decide whether or not a suspected person should be brought to trial on a murder charge.

JUSTICE, DEPARTMENT OF. One of the ten executive departments of the United States government, the Department of Justice was organized in 1870. The head of it, the Attorney-General, is a member of the President's Cabinet and is appointed by the Chief Executive. Prior to 1870, the Attorney-General had been the chief law officer of the nation since the adoption of the Constitution. Before the creation of the department, the Attorney-General was considered simply the legal adviser of the President, although it was his duty also to represent the government in Federal matters before the Supreme Court. By courtesy he was given a seat at the Cabinet table, but not until 1870 did he acquire a Cabinet portfolio.

The Department of Justice is an executive arm of the government, and is not to be confused with the judicial department, which consists of the systems of courts; naturally, however, the department has a close affiliation with all Federal courts.

This department provides means for the enforcement of Federal laws, furnishes legal counsel in Federal cases, and constructs the laws under which the other departments act. It conducts all suits affecting the United States which come before the Supreme Court, supervises Federal prisons, and gives legal advice to the President and the heads of executive departments. It supervises the work of United States attorneys and marshals and takes legal charge of all affairs coming under Federal legislation on trusts, taxes, customs, public lands, alien property, securities, and many other matters. The FBI and the Immigration and Naturalization Service are under it. See CABINET.

JUSTICE OF THE PEACE. In state systems of courts, the justice of the peace is the lowest ranking judicial officer, with jurisdiction inside the boundaries of his township. He is empowered to try minor local offenses; to hear evidence (where there is no regular grand jury) in criminal cases sufficiently to determine whether the accused should be held to trial before a superior court; to preserve the peace; to issue warrants; and to legalize papers for record. In most states there is a provision for four justices in each township. In certain states, justices of the peace may perform marriages. The officer who serves the processes of a justice court is a constable.



THE EASTERN ROMAN EMPIRE'S LAWMAKER—JUSTINIAN

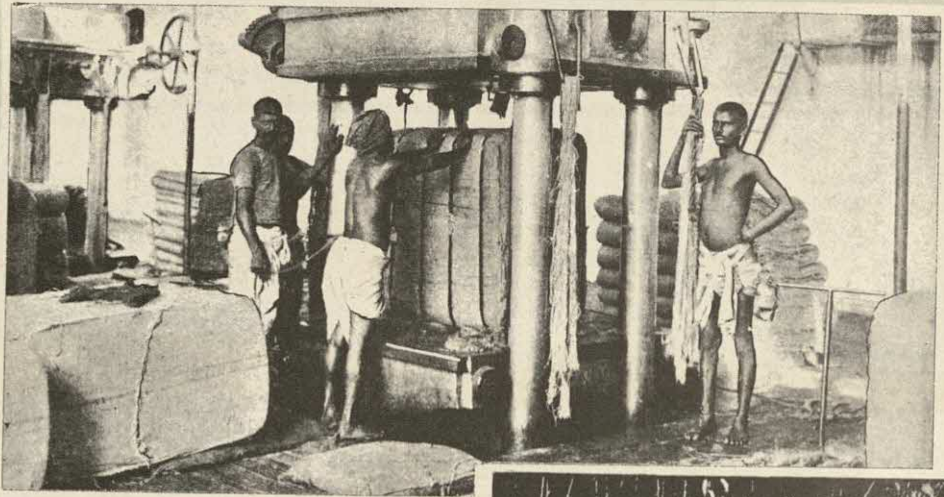
JUSTIN'IAN I (Flavius Anicius Justinianus) (483-565). One of the most famous and valuable contributions of the Roman Empire is the code of laws left by the Byzantine emperor, Justinian I. Justinian was born of a rather obscure family, but on the death of his uncle, Emperor Justin I, he himself became emperor. During the first years of the reign (which lasted from 527 to 565), party riots were frequent in Constantinople, and much of the city was burned. An ardent Christian, Justinian devoted much time to re-establishing the city and restoring religious sanctuaries, particularly the renowned and beautiful Church of Saint Sophia. Then, turning to the empire, with the aid of his generals, Narses and Belisarius, he was able to restore the lost possessions in Persia, Italy, and Africa.

The *Corpus Juris Civilis,* the body of civil law, was drawn up by a commission appointed by the emperor for their legal ability. To finance his building projects and military campaigns, Justinian burdened his people with taxes, and to gain the support of his servants overlooked many of their crimes. Unjustly, perhaps, the title "Great" has been accorded him.

JUTE. One of the cheapest and most used fibers, jute comes from two similar tropical plants. By far its greatest use is in making burlap, or gunny, sacks for carrying countless agricultural and industrial products. A coarse, heavy cloth, burlap is also used to back linoleum and as a baling, wrapping, upholstery, curtain, and even clothing material. Jute is further used in making cheap satins, rugs, mats, yarn, twine, cord, and rope.

Formosa, China, Burma, and Japan produce some jute, but most of the world's supply is grown in East Bengal. Since the partitioning of India, almost all of the peninsula's jute-raising area has belonged to Pakistan and nearly all of its processing plants to the Republic of India. The United States and Scotland are other leading processors of jute.

Members of the basswood family, jute plants are annuals, growing as much as fourteen feet high and having branches only at the top. Planted by scattering seeds on well-tilled soil, with little or no covering, jute is raked, thinned, and weeded when about six inches high. Harvesting consists in cutting down the stalks immediately after they have bloomed, then bundling and retting (soaking) them in warm water to remove their tough outer bark and to loosen their tightly clinging inner fibers. Further separated by clubbing, the fibers are dried and baled.



Right, courtesy Johns-Manville International Corp.

FROM FIELD TO FACTORY

Most of the new jute made into gunny sacks for carrying countless articles of commerce and for sandbag use is grown in Pakistan (right) and is baled for shipment (above).

JUTES. When the Angles and Saxons invaded England in the fifth century, they were aided by the Jutes, a German people. See ANGLO-SAXONS.

JUVENILE COURT. Until fairly recently, youthful lawbreakers, even first and slight offenders, were tried in regular courts and were punished in ordinary prisons. Thus children were forced into contact with the motley, often criminal, crowds of the ordinary courts, were subjected to their often-harmful publicity, and, if found guilty, were sent to prisons where they associated with hardened criminals. The realization that such treatment ruined many children for life resulted in the creation of juvenile courts.

The first of these were founded in Adelaide, Australia, and Toronto, Canada; the first in the United States, in Chicago in 1899. Soon afterward, Denver established a court whose judge, "Ben" B. Lindsey, made it world-famous. Today such courts are part of the national court systems of many lands. They exist in most large American cities.

In the better courts, the judge is a child-psychology specialist or has aides who are. The offender is examined physically and mentally, and his family history, associates, and environment are studied by social workers. Spectators are excluded from the court's proceedings, during which the judge talks informally with the child.

Removing the cause of the child's difficulties and educating him in right living are the goals sought. Punishment is a last resort. Whenever possible, he is paroled but required to report periodically to an officer for help and guidance. If his family is deemed harmful, he may be placed in a foster home. If punishment is required, he is sent to a training school.

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K. Unlike many other letters of our alphabet, *K* underwent only one major change in its transfer from Phoenicia to Greece. The Phoenicians, who used it to symbolize the half-closed palm, wrote it turned around, like this 𐤊. At first the Greeks merely straightened it into an upright position, like this ꓘ ; but later they turned it around and wrote it *K,* just as we do today.

KADIAK, *kahd'yak,* **or KODIAK,** *ko'diak.* Famed for its immense salmon fisheries and the largest bears in the world, Kadiak Island, lying about twenty miles off the Alaska Peninsula, is the biggest Alaskan island, covering about 3,500 square miles. Fur raising and some farming and cattle raising are carried on by the natives, who number less than a thousand. Large canneries are located around Kodiak, the chief settlement. Important American naval and air bases have been maintained on the island since World War II.

KAFFIR, *kaf'ur,* **CORN, or KAFIR,** *kah'fur,* **CORN.** Called *kaffir,* or *kafir, corn,* in the grain trade, the kaffirs are a group of grain sorghums that originated in South Africa. They were introduced into the United States in 1876, and are now an important item in American agriculture. The kaffirs are leafy, stout-stemmed plants three and one-half to seven feet tall. The leafy, juicy stems and edible seeds make splendid fodder or silage, and large acreages are utilized for these purposes. The seeds are practically free from tannin and possess about ninety per cent of the feeding value of shelled corn.

The grain has also been used to some extent in making flour for human consumption. This flour does not make good light bread, but is fairly palatable to most people when cooked in the form of hot buns or

American Museum of Natural History

THE WORLD'S LARGEST CARNIVOROUS ANIMAL

The Kodiak bear is brown and stands about eight feet tall. It eats salmon.

Wide World

Australian Press Bureau

GENTLE BUT FIRM

Kangaroos are naturally peace-loving animals but they are able fighters when necessary. Above, left, mother kangaroo accepts a handout for herself and the baby riding comfortably in her pouch. Right, an attacked kangaroo lashes out with its short, strong forelegs and kicks with the powerful hind legs. It sometimes lures a dog into a pool and then holds its head under water until it drowns.

griddle cakes. One of the chief uses made of kaffir grain is in the preparation of poultry feeds.

KAFFIRS, or KAFIRS, is a word taken from an Arabic word meaning *infidel*. It is also the name of members of Bantu-speaking tribes in southeastern Africa. These are among the tallest people in the world, noted for their excellent body build, or physique. Though somewhat Negroid in appearance, they are lighter in color and are known to have ancestors of the Caucasoid people of the Mediterranean region. The Kaffirs usually live in groups in grass-covered huts near a corral for their livestock. They are chiefly an agricultural people—the women working in the gardens and the men working the fields. In some villages the men also work in the mines and other local industries.

KAISER WILHELM CANAL. See KIEL CANAL.

KALAHARI, *ḳah lah hah′ re,* **DESERT.** In Bechuanaland in Southern Africa is the great Kalahari Desert. Stretching from Lake Ngami to the Orange River, it is about 600 miles long and 400 miles wide. Its great basin has no water except that supplied by shallow, salty lakes. Lying at an altitude of some 3,000 feet, it is covered with thorny trees and shrubs. Its grasslands are the home of antelopes and a few other wild animals, including the elephant, lion, leopard, and giraffe. Grazing of cattle and the raising of melons and vegetables form the chief occupations of its Bushmen and Bakalahari tribes.

KALEVALA, *ḳah le vah′ lah.* Just as the famous Grimm fairy tales were handed down from generation to generation in Germany, so was the *Kalevala* of Finland. Elias Lönnrot, who compiled the epic, gathered his material by traveling through the country and listening to the ancient legends and songs of the peasants, which he collected into a book in 1835. He published a more complete edition in 1849.

Its effect on the Finnish people was immediate, for it began to influence their speech and build up the national spirit. Painters, musicians, and poets gathered inspiration from it. Even Longfellow's *Hiawatha* was patterned after its style.

KAMERUN, *ḳah ma roon′.* See CAMEROON.

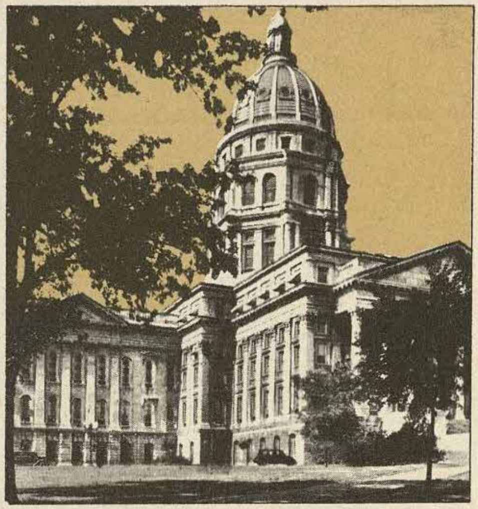
KANGAROO′. When Captain Cook, the explorer, sailed along the northeast coast of Australia in 1770, he discovered a number of peculiar animals there. These, he claimed, were called by the natives, "kanguroo." Although there is little to prove his statement, the name has remained, with a slight change in spelling.

An animal of decided contrasts is the kangaroo, for its forelegs are small and undeveloped and its head is shaped like a deer's. Its hind legs, however, are very large, and the animal supports itself by means of a long, strong tail when standing erect. The kangaroo feeds on vegetation. When pursued by enemies, it can jump fully ten yards at a leap, about four times its own length. Its only weapon is the strong hind legs; a kick from these legs is sufficient to kill a large dog.

An interesting feature of the kangaroo is the way it protects its young. When born, a kangaroo is quite small and poorly developed, and so is carried about in a natural pouch on the mother's abdomen. Kangaroos are timid beasts, but where they are still plentiful they cause considerable damage to farms. They vary in size, some being as small as a hare, and others larger than a sheep. They are easily tamed. Some of them have even been taught to box with their trainers. The skin of the kangaroo is often used for fine leather, and the animal is also hunted for its flesh. The gray-furred *wallaroo* is the largest of all marsupials. *Wallabies* and *tree kangaroos* are smaller types. See MARSUPIALIA.

KAN'SAS. One of the most important events in the history of the United States occurred in Kansas, for here it was that the battle between the abolitionists and the supporters of slavery was joined, testing whether the United States should remain a free or slave-holding country. To the "Sunflower State" was given the task of experimenting with the ideals of a free and democratic people, with the result that Kansas proved that the principles of freedom could prevail over the forces of slavery, but not before armed conflicts and bitter passions had given it the name of "bleeding Kansas." Although since then the state has not been so decisive a factor in national development, it has become one of the most progressive and productive regions in the United States.

Kansas occupies the geographical center of the United States. It is almost a rectangle, 400 miles long and a little more than 200 miles wide. Its area is 82,276 square miles, and it has a population of over 2,183,000.



WHEAT'S CAPITAL, TOPEKA

Land and Waters. Lying in the plains region of the United States, Kansas is a rolling prairie that slopes gently downward from west to east. The surface is occasionally broken by low ridges, hills, and shallow valleys. In the western section the plains merge with a hilly and irregular region. The soil of Kansas is, on the whole, deep and fertile, but in the southwestern section and in the river valleys it becomes quite sandy.

Kansas has few rivers, and only the Missouri, which forms the northeast boundary, is navigable. The important rivers within the state include the Kansas, which drains the northern half; the Arkansas, which extends halfway across the southern portion; and the Cimarron and Neosho, which drain the southwest and southeast, respectively. Most of these streams have tributaries that drain a considerable portion of the state.

Wind and Sun. Like most regions in the plains areas, Kansas has a dry climate, with hot summers and short, mild winters. The average temperature is about 54° F.,

TRUE KANSANS

Not limited to its famous wheat, Kansas produces top-notch livestock; takes pride in it.

although there are occasional great extremes, temperatures ranging from 25° or more below zero to well above 100°. These extremes are, however, balanced by the state's low relative humidity. Rainfall is progressively scarcer from east to west. Although the state averages some twenty-six inches yearly, severe droughts and dust storms are not uncommon in the west. In some years, however, spring floods cause heavy damage. No other state getting so much rain has so many sunny days.

Agriculture. The land of this fertile, chiefly agricultural state is mainly in broad fields and pastures. Even the light rainfall of its western third, almost its only agricultural handicap, is partly overcome by irrigation and dry farming. Moreover, its extensive use of combines and other farm machinery makes it one of the world's most mechanized agricultural areas.

As a wheat-producing state, Kansas usually ranks first, raising about one fifth of the nation's crop. In any case, it leads in growing winter wheat, raised chiefly in the western two thirds of the state. Other important crops include corn, oats, barley, alfalfa and other forage, grain, sorghums, soybeans, potatoes, sugar beets, flax, broomcorn, fruits, vegetables, and melons. Grazing is a chief industry of West Kansas but is important in other sections, too. The state's livestock products include beef and dairy cattle, hogs, mules, sheep, chickens, turkeys, eggs, wool, milk, honey, and beeswax.

Minerals. Petroleum and natural gas are the most valuable minerals. Others include cement, limestone, coal, helium, zinc, natural gasoline, volcanic ash, lead, salt, gypsum, clays, sand, gravel, chalk, and tripoli.

Manufactures. Slaughtering and meat packing, the state's leading industries, are centered chiefly in Kansas City and Wichita, the two largest cities. The latter is also noted for its airplane factories. Other important industries include oil, ore, and beet-sugar refining, flour milling, poultry dressing and packing, publishing, printing, helium production, food canning, and the manufacture of chemicals, machinery, transportation equipment, apparel, cement, brooms, stock feeds, and fabricated metal, dairy, soybean, alfalfa, clay, stone, glass, and coal products.

Transportation. Crisscrossed by railroads, air routes, and modern highways, Kansas has excellent connections with all parts of the nation. Some transportation is also provided by the Missouri River.

People. Most Kansans are native Americans, many of whose ancestors came from the East in pioneer days. The 1950 census was the first to show over half of them living in urban areas — a change resulting from the state's widespread use of farm machinery and its rapidly growing industrialization.

Education. The University of Kansas at Lawrence, heads the state's progressive

Wolfe Commercial Photo Service, Topeka, Kan.

KANSAS GROWS HER GOLD

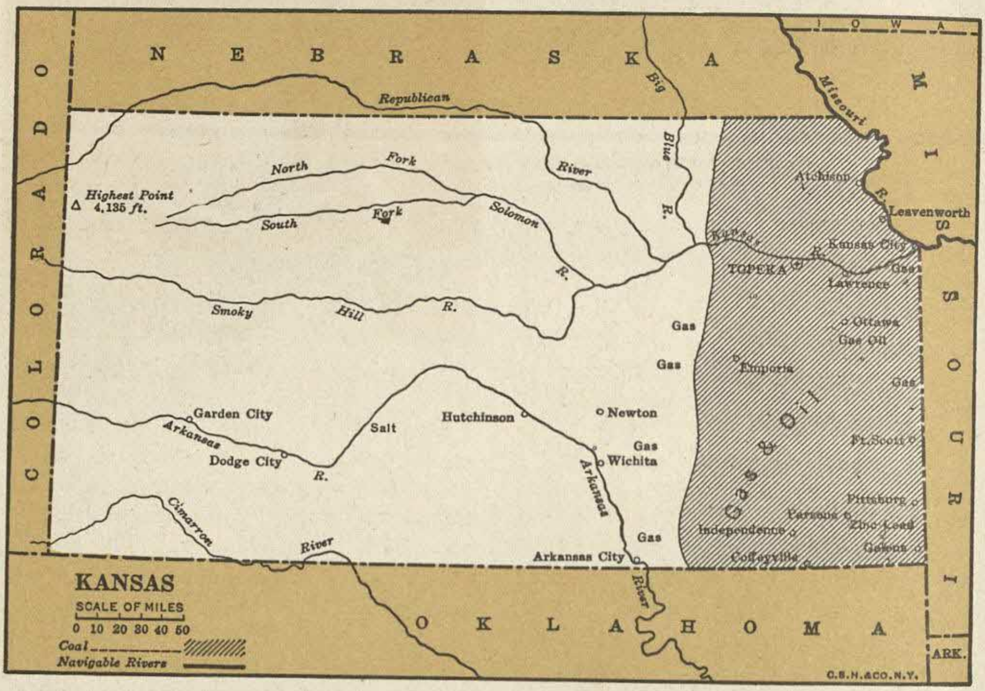
Every year, combines like this harvest huge wheat crops under hot Kansas skies.

school system. Other institutions of higher learning include state colleges at Emporia, Pittsburg, Fort Hays, and Manhattan; Baker, Friends, Ottawa, Wichita and Washburn Municipal universities, and the famous Haskell Institute for Indians.

Government. Kansas elects its governor and other state officers for two years. Its senators are elected for four years; the members of the legislature's lower house, for two. An elected supreme court heads its judiciary department. Topeka is the capital.

History. When Spanish, gold-seeking Coronado and his expedition reached Kansas in 1541, its only human inhabitants were its Pawnee, Osage, and other Indians. The region was rarely visited until it passed to the United States with the Louisiana Purchase in 1803. A year later the Lewis and Clark Expedition reached Kansas on its way west, as did Zebulon Pike's, in 1806. After that, it was often crossed by other exploring expeditions, by traders using the Santa Fe Trail, and by pioneers traveling the Oregon and California trails. Meanwhile, the first important town, Fort Leavenworth, was established in 1827.

Kansas was part of the Territory of Missouri until 1821, when it became unorganized territory. It was not until 1852,



WHERE NATURE IS BOUNTEOUS—KANSAS, LAND OF WHEAT AND OIL

however, that it had enough settlers to ask Congress to organize it. The passage of the Kansas-Nebraska Bill in 1854 granted this request, but also repealed the Missouri Compromise of 1820, which had said that Kansas should forever be free territory. Since the new bill left it to the settlers to decide whether Kansas should be free or slaveholding, a state of open warfare soon existed between its proslavery and antislavery groups. When an antislavery government was set up in 1856, proslavery fanatics burned and sacked Lawrence. Three days later, the cause of freedom was set back by John Brown's famous raid and the murder of five proslavery men at Pottawatomie Creek. A free-state constitution was written and ratified in 1859, and two years later Kansas entered the Union as a free state.

Before 1939 the state's industry was largely agricultural. After the start of World War II, however, it began to experience its own industrial revolution. See BROWN, JOHN; CORONADO, FRANCISCO; KANSAS-NEBRASKA BILL; TOPEKA.

KANSAS CITY, Mo. Situated on high bluffs at the junction of the Kansas (Kaw) and Missouri rivers, Kansas City ranks second in size and importance only to St. Louis, the state's metropolis. Its population is about 473,000. The population of the Kansas City Standard Metropolitan Statistical Area, including Kansas City, Kan., is about 1,038,000.

A great rail, airline, and highway hub, the city is called the "Gateway to the Southwest." It is the nation's largest winter-wheat market and a leading distributor of seeds, grain sorghums, general grains, agricultural implements, fruits, vegetables, poultry, eggs, butter, soap, and lumber. With adjoining Kansas City, Kan., it is one of the nation's leading livestock and meat-packing centers. Other industries include food processing, oil refining, and automobile assembly. The city ranks second in the nation in grain storage and is a great banking center.

Kansas City is noted for its fine homes, parks, and boulevards, airports, railroad terminal, city museum, and William Rockhill Nelson Gallery of Art. Its educational institutions include the University of Kansas City, a research institute, music conservatory, art institute and school of design, and several colleges.

History. The city grew out of Westport Landing, a fur-trading post established by François Chouteau in 1821, and of Westport, four miles south on the Missouri. Westport Landing was incorporated as the Town of Kansas in 1850. It was named Kansas City in 1889. Westport, long the starting point of the Santa Fe and Oregon trails, became part of the city in 1899.

KANSAS-NEBRASKA BILL. Providing for the establishment of Kansas and Nebraska territories, this bill was passed by the United States Congress in 1854 after a bitter fight. Since it voided the Missouri Compromise of 1820, which had prohibited slavery north of latitude 36° 30′ in the region west of Missouri and Iowa, and permitted the area's voters to decide the slavery question, it was a victory for those who favored slavery. This widened the rift between slavery and antislavery forces, brought on bloody fighting in Kansas, and hastened the War between the States. See KANSAS; MISSOURI COMPROMISE.

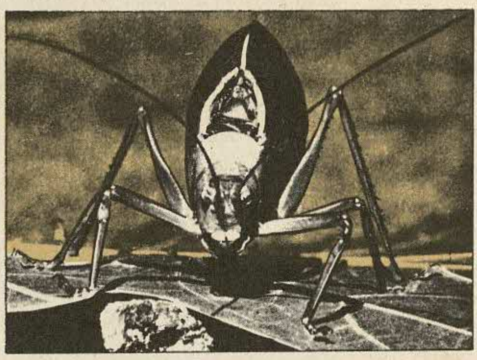
KA′OLIN. A clay used in making fine porcelain and pottery, and as a paper filler, kaolin is obtained from decomposed feldspar. It contains silica and alumina chiefly and turns white when baked. Its name comes from *Kaoling,* a Chinese hill, where it was first found. Large deposits are mined in China, England, France, Germany, and various parts of the United States.

KARACHI, *ka rah′ chee,* PAKISTAN. See PAKISTAN.

KAR′NAK. See THEBES.

KASHMIR, *kash′ mihr.* See INDIA.

KATYDID. In the late summer and in the fall, the familiar song of this insect is sometimes confused with that of certain tree crickets. The katydid "sings" by rubbing together the bases of the front wings.



EVENING SONGSTER. THE KATYDID

Katydids are related to the meadow grasshoppers. They are almost always green in color, with legs and antennae and sometimes wings much longer than is usual with the grasshoppers. This is especially true of the antennae, which are always longer than the body. Most katydids have wings broad near the base; consequently they look humpbacked, and their general appearance is very awkward. Most true katydids live in trees and eat foliage, but they do little damage. They lay their eggs in rows on twigs. The eggs, which are sometimes mistaken for scale insects, are slaty gray in color, oval and flattened, and nearly one-eighth of an inch in length.

KAYAK, *kí′ ak.* See BOAT; ESKIMO.

KEATS, *keets,* JOHN (1795-1821). Unlike the other poets of the Romantic Period in England, John Keats was untouched by the bitter feelings of the day. Instead, he found escape in life and beauty. During his short life, Keats had time to publish only three small volumes. Yet his poetry is ranked among the greatest in English literature.

Born in poor circumstances at London, Keats nevertheless received a fair education. When he was fifteen years old, he was apprenticed to a surgeon and studied for several years in London hospitals. He spent his free time reading the classics, which led him to give up medicine and enter upon a literary career. His first volume of poetry, which appeared in 1817, was immature and received little notice. His second volume, entitled *Endymion,* was published in 1818, and was unfavorably received by the literary critics. *Endymion* was written in heroic couplet and told the story of the classical myth about the love of a mortal for the moon goddess.

In his last volume, which appeared in 1820, Keats reached the height of his power as a poet. It contains classical poems, such as *Hyperion;* metrical romances, such as *La Belle Dame Sans Merci* and *The Eve of Saint Agnes,* and such great odes as *To A Nightingale* and *Ode on a Grecian Urn.*

Stricken with consumption in 1820, he went to Italy in the vain hope of regaining health; but after a few months in Rome he died, in February, 1821.

KEL'LER, HELEN ADAMS (1880-). An example of amazing courage and determination, Helen Keller, American writer and lecturer, lost her sight, hearing, and speech when she was nineteen months old. Her progress toward learning to write, read, and finally speak has encouraged the handicapped everywhere. Her success has also inspired research into ways of helping the deaf, dumb, and blind and has resulted in many invaluable aids for the handicapped. Miss Keller began her difficult task under the direction of Miss Anne Sullivan, who was her teacher for many years. Graduating from Radcliffe College in 1904, she devoted her time to writing, lecturing, and aiding the handicapped.

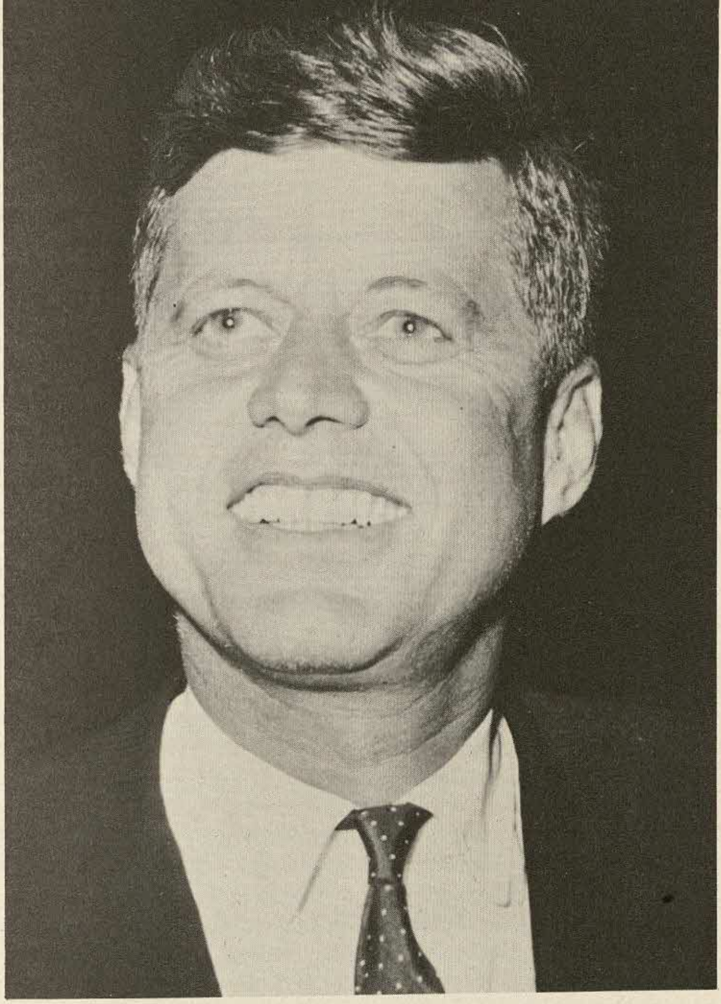
KELP. When certain kinds of seaweed are burned, the resulting ash is a crude alkaline substance known as kelp. Some types of seaweed, even before burning, bear the name. These seaweeds are found off the Pacific coast of the United States and off the coasts of Ireland, Scotland, and Brittany. The value of kelp was discovered during World War I, when potash was made from it after the imports of German potash were cut off. Potassium sulphate, potassium chloride, sodium carbonate, and iodine are obtained from kelp.

KENNEDY, JOHN FITZGERALD (1917-), thirty-fifth president of the United States, was the youngest man ever elected to the presidency, and the second youngest man to serve as the nation's chief executive. A man of great personal popularity, he was elected to the presidency in 1960 after serving six years as a Congressman, and eight years as a member of the United States Senate.

Early Years. Kennedy was born in Brookline, Mass., on May 29, 1917. He was the second of nine children born to Joseph Patrick Kennedy, Boston financier, and Rose Fitzgerald Kennedy. The senior Kennedy was active in both industry and public life. During the Roosevelt administration, he served for a time as chairman of the Securities and Exchange Commission, and of the United States Maritime Commission. He was United States ambassador to Great Britain from 1937 to 1940. Young Kennedy was graduated from Harvard with a B.S. *cum laude* in 1940.

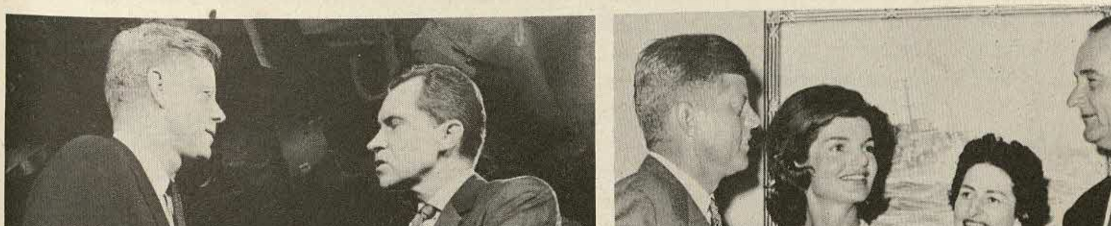
War Record. In 1941, Kennedy was called to active service in the United States Navy. He served until 1945 as a PT boat commander in the South Pacific. On one occasion his boat was rammed by a Japanese destroyer. Despite his own wounds, Kennedy saved the life of one crewman and was credited with leading his shipmates to safety from behind the Japanese lines. In addition to the Purple Heart, he received two decorations for heroism. After his discharge, he served as a news correspondent for a year.

Political Life. Kennedy's first political victory came in 1947 when he was elected to Congress from the Eleventh Massachusetts District. During his third term in Congress, he met Jacqueline Bouvier, then working as a newspaper photograhper in Washington. They were married in 1953. Kennedy's first term in the U.S. Senate began in 1953, following his victory over Henry Cabot Lodge. As a senator, Kennedy drew heavily upon his wide study of foreign and domestic affairs. He was a vigorous advocate of world peace, and was particularly active in behalf of Communist-enslaved Poland. His fight for the passage of the St. Lawrence Seaway bill won special recognition in the Great Lakes states. He worked closely with his brother Robert, chief coun-



UPI

JOHN FITZGERALD KENNEDY
Thirty-fifth President of the United States, Kennedy was the youngest man ever named to that office. When elected, the World War II hero had served six years as a Congressman and eight as a member of the United States Senate.



Above left: Kennedy and Richard M. Nixon continued their argument privately after one of their historic television debates. Above right: Kennedy, Lyndon Johnson, and their wives, Jacqueline and Lady Bird, conferred at Kennedy's Massachusetts home following the convention.

sel of the Senate rackets committee, in the battle to free American labor and management from the grip of racketeers, hoodlums, and union-busters.

As Author. Kennedy's work as a newspaper correspondent and his extensive travels in more than thirty countries of Europe, Asia, Africa, and Latin America furnished much of the background for his writings. His first book *Why England Slept* was published in 1940. His second work *Profiles in Courage* won the 1957 Pulitzer prize for biography. His third book *The Strategy of Peace* appeared in 1960.

The Campaign. Kennedy opened his bid for the presidency early in 1960, entering and winning the primaries of seven states by wide margins. When the Democratic national convention met in Los Angeles in July, 1960, Kennedy polled 806 votes against Lyndon Johnson's 409 on the first ballot. Johnson then withdrew along with Adlai Stevenson, Stuart Symington, and others, making Kennedy's nomination unanimous. Johnson was named Kennedy's running mate.

In his television debates with Vice-President Nixon and in his swing through the various states, Kennedy called for a more dynamic foreign policy and greater military strength as the keys to lasting peace. He also advocated a higher minimum wage, increased unemployment compensation, a broader Federal housing program, and the distribution of surplus food as a means to bolster farm income. Kennedy was the sponsor of a bill to provide hospital and medical care, housing, and recreational facilities for the aged. He also defended equal civil liberties in housing, education, and economic opportunity for all citizens.

The election on November 8, 1960, was one of the closest in the nation's history. The popular vote gave Kennedy the narrowest margin of victory since 1876.

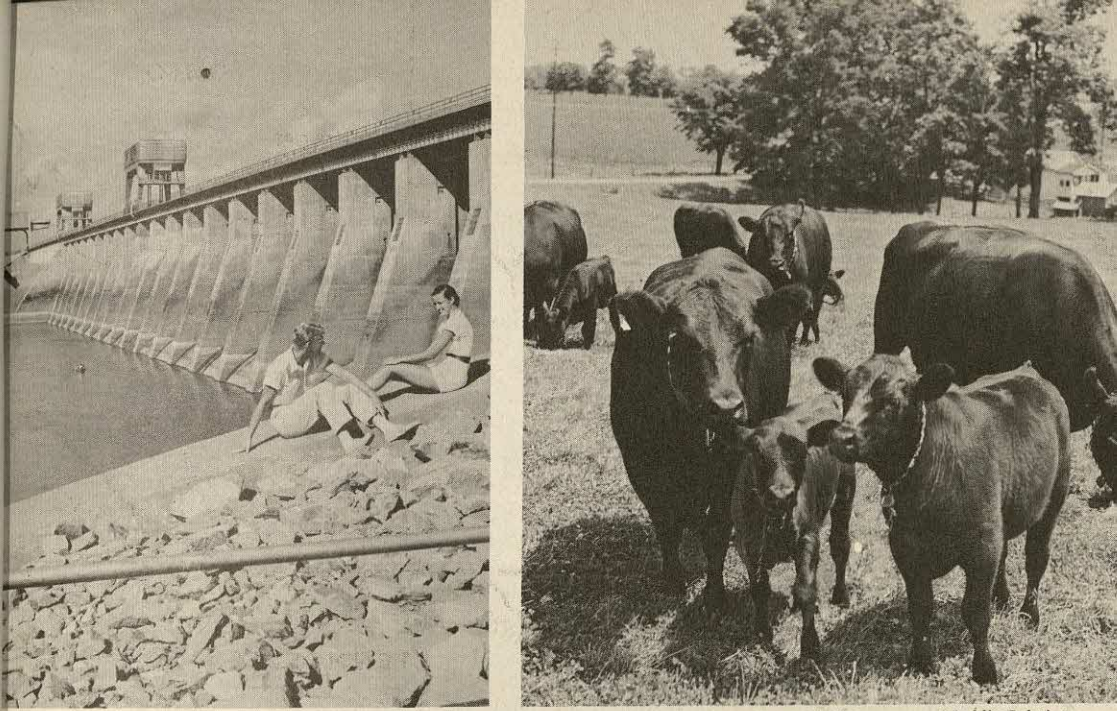
KENTUCKY. The first part of the United States to be settled west of the Allegheny Mountains was Kentucky. Today, the "Blue Grass State" is a productive farming region noted for its excellent tobacco crops and fine horses. The Ohio River separates it from Illinois, Indiana, and Ohio on the north; the Mississippi River from Missouri on the west; and the Big Sandy River and its Tug tributary from West Virginia on the northeast. Virginia adjoins it on the southeast and Tennessee stretches along its entire southern boundary. The area of Kentucky is 40,395 square miles, and the population is about 3,042,000.

The Land and its Waters. Kentucky can be divided into several topographic regions. The eastern fourth of the state is rugged and mountainous. The extreme southeastern section is crossed by the Cumberland and Pine mountains, where altitudes of 2,000 to 4,000 feet are reached. To the north is the lower but steep-sided Allegheny Plateau. The region is noted for its hardwood forests and beautiful scenery. Bordering the mountains is an undulating and hilly section known as the Knobs, the heart of the famous Blue Grass region. Further west the surface is rough and hilly, with many limestone formations. Here are located many caves, including Mammoth Cave, one of the largest in the world.

Kentucky's chief rivers are the Kentucky, Tennessee, Cumberland, Green, and Licking. Federal TVA dams in the state have created some of the world's largest artificial lakes, notably the Kentucky and Cumberland.

Climate. Kentucky has a comparatively mild climate with an average annual temperature of about 55° F.; the highest is seldom above 90° or the lowest below zero. Snowfall is scanty and lies on the ground only a short time. The average yearly precipitation is forty-four inches.

Minerals and Forests. Kentucky is one of the nation's leading soft-coal producers. There are large deposits in the east, where Harlan and Hazard are famous mining centers. Rich deposits of natural gas and oil occur near the coal fields. Other minerals include fluorspar, clay, lead, and zinc. At one time eastern Kentucky was covered by heavy forests of oak, ash, walnut, hickory, and maple, but only a small portion of the original growth remains.



Kentucky Department of Public Relations

THE CHANGING FACE OF KENTUCKY
T.V.A.'s Kentucky Dam (above), major source of power on the Tennessee River, forms Kentucky Lake, a popular vacation center. (Right) Aberdeen-Angus cattle graze contentedly in Kentucky's Blue Grass region.

Agriculture. Farming is by far the most important industry in Kentucky, and tobacco the most valuable crop. The state ranks second only to North Carolina in tobacco production. The famous white Burley tobacco is bought by American cigarette companies, while much of the dark tobacco is exported to Europe. Corn is also important. Other farm products include wheat, hay, soybeans, bluegrass seed, popcorn, apples, and strawberries. In addition to the famous Kentucky race horses, sheep, hogs, cattle, and mules are raised in large numbers.

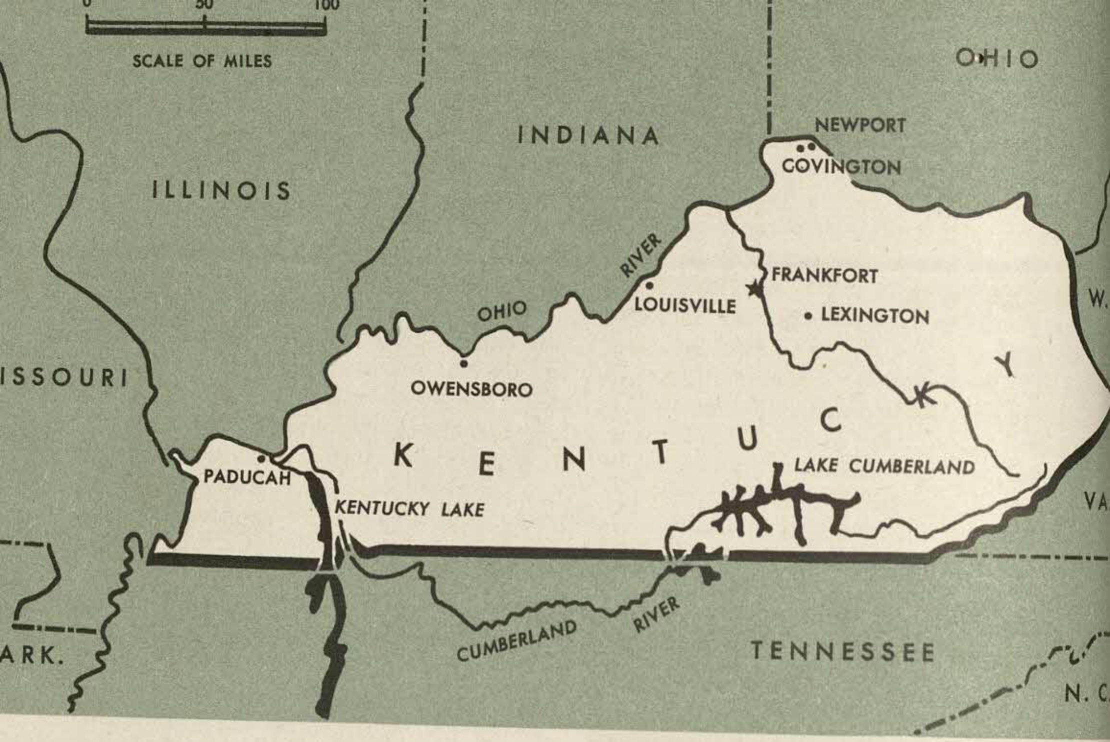
Manufacturing and Transportation. The manufacture of tobacco products is one of Kentucky's leading industries. Lexington is one of the world's greatest tobacco markets. The distilling of whisky is also important. Louisville has flourishing steel plants, and meat packing and tanning factories. Scattered throughout the state are flour mills and canning factories.

Kentucky has many miles of navigable waterways, the most important being the Ohio, Tennessee, Green, Cumberland, and Kentucky rivers. There are also about 4,000 miles of railways. A good system of highways serves all parts of the state.

The People and Their Institutions. Many of the people of Kentucky are descendants of the early pioneers who arrived before the Revolutionary War. In the eastern mountain regions are large groups of English and Scotch-Irish. In addition to many Negroes, there are also many Northern Europeans and Italians.

The school system is supervised by a state board of education, headed by the superintendent of education. Education is free and compulsory for pupils between the ages of seven and fifteen. In addition to the University of Kentucky at Lexington, there are five other state-supported colleges and universities, including a number of normal schools for teachers.

The governor and other state officers are elected for terms of four years, and are not eligible for succeeding terms. The legislative branch consists of two houses—a senate with thirty-eight members elected for four-year terms, and a house of representatives composed of 100 members elected for two-year terms. The supreme court is



ODDLY SHAPED KENTUCKY, THOUGH MAINLY AGRICULTURAL, HAS COAL AND OIL

at the head of the judiciary branch, which, in addition, is composed of circuit courts, county courts, and justice courts.

History. The first settlement in Kentucky was established at Harrodsburg in 1774 by James Harrod. Several years before, in 1750, the region had been visited by Dr. Thomas Walker, and following him many traders had explored the territory. The accounts of one of these, John Finley, attracted Daniel Boone to the country; it was he who blazed the famous Wilderness Trail and in 1775 established a fort called Boonesboro.

Until 1790, when Kentucky became an independent territory, it was claimed by Virginia. As the territory began to fill up with the migrating pioneers, there was a growing movement to make Kentucky a state, and in 1792 it became the fifteenth state of the United States, with Frankfort as the capital. The state immediately took a leading part in affairs of the new nation, contributing leaders to the national government and furnishing valuable aid in the War of 1812. The state was divided over slavery and was the scene of several battles during the War between the States, but did not secede. After the war an era of progress began. In 1936 the Federal Government built its gold depository at Fort Knox and, after World War II, started erecting a huge atomic-energy plant at Paducah. Kentucky's scenery and historic shrines make tourism a leading industry.

Famous Kentuckians have included Presidents Abraham Lincoln and Zachary Taylor; Vice-Presidents Richard M. Johnson, John C. Breckinridge, and Alben Barkley; the Confederacy's President, Jefferson Davis; Henry Clay and "Kit" Carson. A stately old home near Bardstown inspired Stephen C. Foster to write his song *My Old Kentucky Home.* See LOUISVILLE.

KENTUCKY AND VIRGINIA RESOLUTIONS. The Kentucky Resolutions, written by Thomas Jefferson and passed by the state legislature in 1798, condemned the Alien and Sedition Laws and accused the Federal Government of assuming state powers. Next year the legislature declared its right to nullify a Federal law. James

Madison wrote the similar Virginia Resolutions. See ALIEN AND SEDITION LAWS.

KENYA, *keen' yuh.* This part of British East Africa extends inland from the Indian Ocean and Somalia (formerly Italian Somaliland) to Uganda and Lake Victoria. To the north lie Ethiopia, Lake Rudolf, and the Sudan; to the south, Tanganyika. Covering about 225,000 square miles, Kenya has some 6,300,000 inhabitants, mostly Africans. Others living there include Indians, Arabs, and Europeans, many of whom settled there after World War II.

The tropically hot, humid coastal strip and several outlying islands, leased from the Sultan of Zanzibar, form a British protectorate. Its capital and Kenya's chief port is Mombasa, on the island of that name. The interior, a British crown colony since 1920, is made up of a large, generally arid and subtropical area in the north and the temperate highlands of the south. Its capital is Nairobi. The chief products of this largely agricultural land include sisal, coffee, tea, sugar cane, cotton, corn, skins and hides. Much of the farming is done on the large European-owned plantations in the highlands. In the almost waterless north, native herdsmen follow their cattle, sheep, goats, donkeys, and camels from one grassland to another.

After World War II a secret society called *Mau Mau* was formed by members of the Kikuyu tribe to oust the whites, and a reign of terror followed.

KEP'LER, JOHANNES (1571-1630). The modern theory of the motions of the planets is based on the laws formulated by this German astronomer, who was born in Württemberg. Kepler assisted the noted astronomer Tycho Brahe at Prague and in 1601 succeeded him as royal astronomer and mathematician. His work led to the invention of calculus. Kepler's laws of planetary motion, which influenced Newton, follow: (1) Every planet travels in an ellipse with the sun at one of its foci; (2) a line joining the center of the sun with the center of a planet moves over equal areas in equal times; (3) the square of the period of complete revolution of a planet around the sun is proportional to the cube of its mean distance from the sun. See SOLAR SYSTEM.

KER'OSENE. Soon after the sinking of the first successful oil well in 1856, kerosene-burning lamps were in wide use. Later, coal oil, as kerosene is also called, was used to run heating and cooking stoves and various machines, as well. Although other fuels and sources of power have largely replaced it, kerosene is still used for such purposes, chiefly on farms and in villages where other fuels are unavailable. Made by distilling crude petroleum, kerosene is practically colorless and has a strong odor.

KEY. Every musical composition is written in a key — all the tones making up a given scale. Thus there are twelve major and twelve minor keys — one for each of the scales. The name of each comes from the *keynote,* the first, or *tonic,* note of the scale. See SCALE.

KEY, FRANCIS SCOTT (1779-1843). Inspired by the sight of "Old Glory" flying over Fort McHenry after a fierce British bombardment during the War of 1812, Francis Scott Key won undying fame by scribbling on an old letter the song that later became the national anthem of the United States. (For this story see STAR-SPANGLED BANNER.) Born in Frederick (now Carroll) County, Md., Key was educated at Saint John's College in Annapolis, then practiced law in Frederick, Md., and Washington, D. C. After composing his only memorable verse, he became district attorney for the District of Columbia.

KHARTOUM, *khar toom'.* Capital of the Sudan in East Africa, Khartoum lies along the Blue Nile, near its junction with the White Nile. Since it is connected with the African interior by river boat and also by rail, as it is with Egypt and the Red Sea ports, it is an important transportation and trading center for a vast area. In addition, air routes link it with the rest of the world. A modern city, it is noted for its University College, consisting of Gordon Memorial College and Kitchener College of Medicine.

Its population is about 93,100.

Founded by Egyptians in the 1820's, the city became the seat of their Sudanese government in 1850. In 1855 it was captured and practically destroyed by Mohammed Ahmed (the Mahdi), the leader of a native Moslem revolt. While helping to defend the city, a whole British garrison and its heroic commander, Charles Gordon ("Chinese" Gordon), were massacred after a long siege and brave stand. Recaptured by Anglo-Egyptian troops under Lord Kitchener in 1898, the city was rebuilt. See KITCHENER, HORATIO HERBERT; SUDAN.

KHRUSHCHEV, *kruz' chuff,* NIKITA (1894-), Premier of the Soviet Union and First Secretary of the Communist Central Committee, was born in the Ukraine. He joined the Communist party in 1918 and began to rise in party offices. Following Stalin's death in 1953, Khrushchev ousted leaders such as Malenkov and Molotov. In 1958 he was elected premier by forcing out Bulganin. His handling of world affairs and of Russia's industrial and military development made him the most powerful leader since Stalin. His book, *To Victory in Peaceful Competition with Capitalism,* was published in 1959.

KHYBER, *ki' bur,* **PASS.** Almost the only practicable land trade route between the subcontinent of India and the outside world, "the Khyber" is one of the earth's most famous mountain passes. Some thirty-three miles long and, in places, under twenty miles wide, it winds through deep canyons in the Hindu Kush range. Its chief gateway cities are Peshawar, in Pakistan, and Kabul, in Afghanistan, some two hundred miles apart. As trade flows over their connecting road, the tinkle of camel-caravan bells mingles with the roar of motor trucks. A military railroad runs from Peshawar to the border.

For centuries, the pass was used by most of India's invaders. It was also the scene of sharp fighting during the British-Afghan wars of the 1800's. When Britain ruled India, its soldiers and fortresses guarded the pass, as do those of Pakistan and Afghanistan today. Even in peacetime, armed guards accompany travelers to protect them against bandits and feuding tribesmen.

KICKAPOO, *kik' a poo.* The Indians who lived in the Ohio Valley before 1819 were members of the Kickapoo tribe, one of the Algonquian family. After that year, however, they migrated to areas farther west, principally Texas. From there a number crossed over into Mexico. At present there are not more than a few hundred Kickapoos. They live mostly in Mexico and in Oklahoma. Their numbers in Mexico are said to be increasing, but the American community is rapidly diminishing.

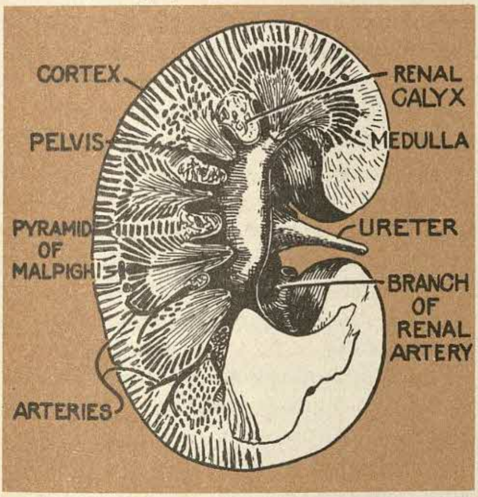
KIDD, WILLIAM (about 1650-1701). Pirate treasure is buried somewhere along the Atlantic coast in the vicinity of New York City, according to the tales which have persisted since the days of the celebrated Captain Kidd. This swashbuckling robber is said to have hidden his loot before he was put to death; but even though many searches have been made, none of the treasure has been discovered except what the authorities found on Gardiner's Island (off Long Island) before Kidd's death.

Captain Kidd, born, probably, in Scotland, was first a legitimate trader. Piracy was flourishing in those days, and in 1696 he was appointed by the king, William III, to war upon the freebooters lurking near the coast of Africa. But instead of checking piracy, Kidd flew the black flag himself, and soon his name became the most feared by the traders of the East Indies. Then, when he finally returned to New York, he was arrested, charged with piracy and murder, and sent to England. After a trial in which he was allowed no counsel, he was hanged.

KID'NEYS. Waste matter is separated from the blood by the kidneys and sent to the bladder for expulsion from the body. The importance of these organs is indicated by the fact that every twenty-four hours, 1,700 quarts of blood flow through them to be purified.

The kidneys are located on either side of the spine just above the small of the back.

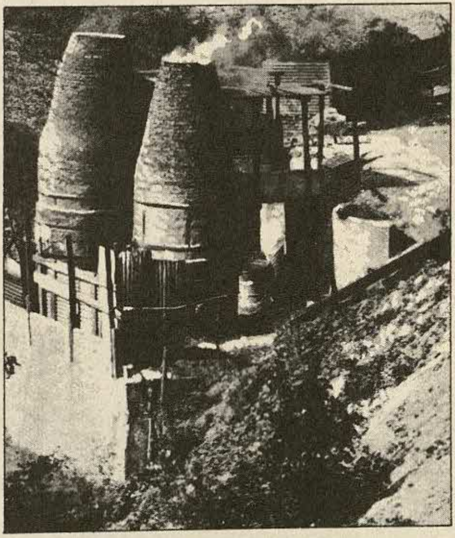
They are bean-shaped structures about four inches long and two and one-half inches across, and each weighs about a quarter of a pound. They are dark red in color, and the interior is a veritable network of blood vessels and capillaries. The most important substance expelled from the kidneys to the bladder is urine. Because good health is dependent on the proper functioning of kidneys, any trouble connected with them should be immediately brought to the attention of a physician.



BODY PURIFIER, THE KIDNEY

KIEL, *keel,* **CANAL.** Over sixty miles long, this German canal shortens the water route between the Baltic and North seas by some two hundred miles. Although an extremely useful commercial waterway, it was built primarily for wartime naval service. During World Wars I and II it was an invaluable short cut between Germany's fleet headquarters at Kiel and the open sea. When Allied mines and blockades kept the German ships at home, they took refuge in the canal. During World War II, frequent Allied bombings seriously damaged the fortified canal and its naval-base port.

KILL'DEER. Common in North America, this species of plover is named for its cry. Some ten inches long, it is brownish, with a white breast and forehead and two black throat bands. The bird's eggs are buff-colored, spotted with black. Killdeers travel in flocks, are suspicious, and utter loud cries when disturbed. They are most plentiful near bodies of water, but are also found in fields, and they feed on grasshoppers, grubs, and other insects of the fields and pastures. See Plover.



WHERE HEAT IS THE BUILDER

The manufacture of many products requires the use of kilns for the long, slow baking of their raw materials. This lime kiln in England has been in operation for more than 700 years.

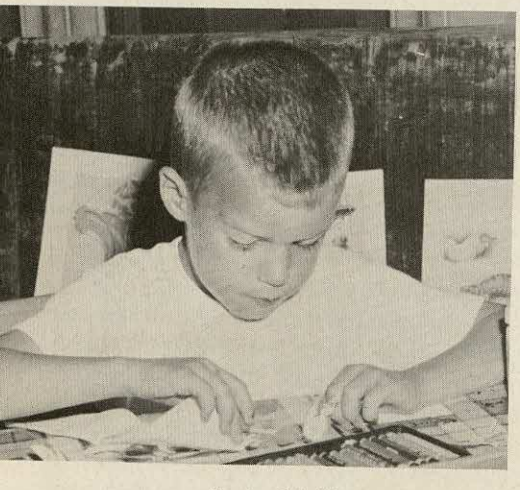
KILN, *kil,* or *kiln.* Constructed of either brick or stone, a kiln is an oven or furnace in which various materials are dried, burned, or hardened. There are many different types of kilns, each constructed to suit the material to be treated. Limestone is burned in huge, chimney-like kilns in the manufacture of lime; bricks are hardened in flat, circular structures ten feet high and thirty feet in diameter. All kilns are built on the same principle—to produce as much heat as possible with a minimum of fuel.

KILOGRAM. A metric weight, the kilogram is equal to 1,000 grams. See Gram; Metric System.

KILOGRAM-METER. The unit of work in the metric system, the kilogram-meter corresponds to the foot pound in the English system. It is the amount of work necessary to lift a kilogram (2.2 lb.) vertically a distance of one meter (39.37 in.). It equals 7.233 foot pounds. The kilogrammeter is used chiefly in scientific work. See Foot Pound; Metric System.

KIL'OMETER. A linear measurement in the metric system, the kilometer is equal to 1,000 meters. See Metric System.

KIL'OWATT. Electric power is measured by the kilowatt. This unit is equal to 1,000 watts or to 1.342 horse power. Kilowatt is abbreviated *kw.* Users of electricity developed by commercial companies are commonly charged according to the number of *kilowatt hours* shown by their meters (see Electric Meter). A kilowatt hour is the amount of electrical energy consumed when a power of one kilowatt is used for one hour or, for example, a forty-watt lamp is kept lighted for twenty-five hours. See Watt.



Tangley Oaks Educational Center

HE TENDER YEARS OF LEARNING

KIN'DERGARTEN. Not so many years ago, all children started to school at the age of six to learn the three "R's." Today, particularly in cities and towns over 5,000, the education of American children begins at the age of five or even four, in the kindergarten. This change has largely been brought about through the ingenuity of Friedrich Froebel, who established the first kindergarten in Germany in the year 1837. The name is a German word and it means, literally, *child garden.*

History of the Kindergarten. The early Greeks and Romans established schools for instructing children under seven, and so well were the young pupils taught that they often discoursed on serious subjects. Although such ability was remarkable considering the age of the children, this method is open to criticism because it unduly forced young minds.

In the seventeenth century came Comenius, Bishop of Moravia, who brought forth a book, fully illustrated, that was more in line with the mental capacity of normal children. He was followed by Rousseau, Pestalozzi, and others, all of whom planned improvements more suited to the needs of very young pupils. But it remained for Froebel to bring forth the real solution, the kindergarten, where education is planned to match the natural growth of the child.

The Work of the Kindergarten. Every kindergarten is provided with children's furniture, play apparatus, building materials, and drawing and construction equipment. Thus the school is equipped to plan and execute numerous projects that are a combination of work and play, such as school gardens, play stores, handwork, and paper cutting and fitting. Storytelling and acting occupy a prominent part in the day's program. Time is taken out for complete relaxing play at regular intervals. The children learn to make things, do little tasks, and achieve results, and the presentation is so remarkably interesting in a good kindergarten that the child does not think of the class as a school.

Not the least important thing learned by the children in a kindergarten is the ability to work and play together pleasantly and harmoniously. See Froebel, Friedrich.

KINEMATICS, *kin e mat'iks.* A division of the science of mechanics, kinematics is the study of pure motion without any consideration of the forces which cause that movement. For example, when a stone is dropped to the earth, the force of gravity acting on the weight of the body causes it to fall in a straight line. In such a problem, kinematics would be concerned only with the movement and pay no attention to the forces causing it. There are two general types of motion: *linear,* or straight-line movement, and *angular,* or movement about an axis.

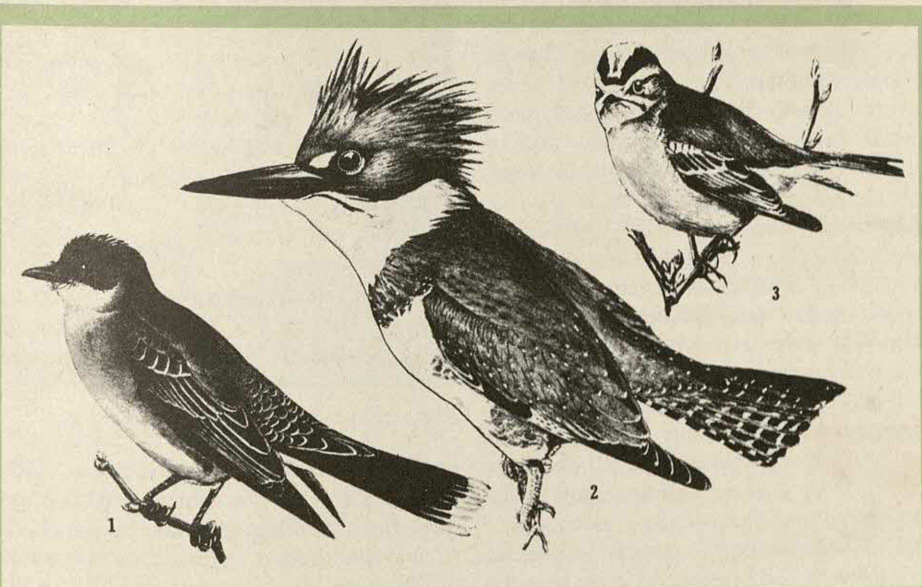
KING. The ancient maxim, "A king can do no wrong," was widely believed in the days of the early rulers, for these kings had absolute power over their subjects and countries and were the source of all law and authority. The theory developed that a king ruled by "divine right." In the articles in this set about England, Germany, France, Spain, and other European countries, will be found mention of many famous kings of history. In recent times, the few left have lost much of their power, being limited either by law or by a constitution; so that today no king has supreme authority over his country. Modern kings retain their titles as rulers, but actually have little or no power. See GOVERNMENT.

KING, WILLIAM LYON MACKENZIE (1874-1950.) Born in Ontario, the grandson of the famous Canadian rebel, William Lyon Mackenzie, this statesman headed his country's government for over twenty one years, a record unequaled in the history of the Commonwealth. First elected to Parliament in 1908, he became leader of the Liberal party in 1919 and Prime Minister in 1921. With the exception of the years from 1930 to 1935, he remained in power until his voluntary retirement in 1948. During his tenure of office, Canada became a leading "middle power" in international affairs. See CANADA.

KING CRAB. See HORSESHOE CRAB.

KING'FISHERS. Often seen perched on a limb above the water or swooping low over pond or stream, kingfishers have a loud, rattling call different from that of any other bird. They are about thirteen inches in length, mostly bluish slate and white in color, with a large, crested head and long, heavy bill.

The kingfishers nest in holes in banks, burrowing three to twelve feet from the



THE BIRD WORLD'S KINGS ARE BORN WITH THEIR CROWNS
Because all these birds wear striking natural crests, their names begin with *king.* They are not particularly close relatives. (1) Kingbird. (2) Kingfisher. (3) Kinglet.

entrance. In the enlarged chamber at the end of the tunnel, four to eleven white eggs are laid, and the naked young are cared for until they can fly.

The fishes taken by the kingfisher are usually small and unimportant, but at times it does harm to commercial fisheries and must be controlled. After catching a fish by plunging fearlessly, it shakes off the water, flies to a perch, stuns its victim, and then proceeds to swallow its meal headfirst.

KING GEORGE'S WAR. See French and Indian Wars.

KING'LET. Two small, active birds of North America are the *golden-crowned* and the *ruby-crowned* kinglets. They are about three and three-quarters and four and one-quarter inches long, respectively, only the humming birds being smaller. The general color is olive-green above, whitish below. On the top of the head of the male is a bright-colored patch, orange and yellow in one case, flaming red in the other. Ordinarily, this bright color is concealed, but shows when the crown feathers are lifted by the bird into a crest.

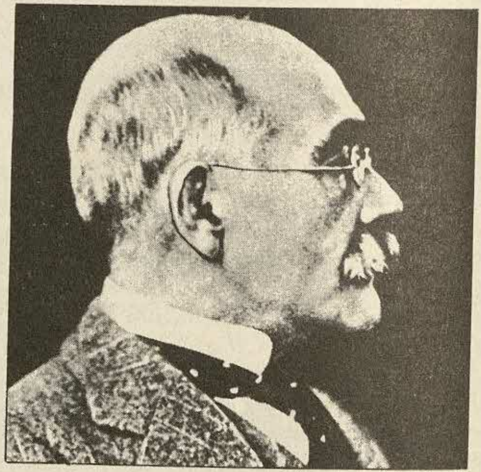
These tiny birds are very hardy. They nest in Canada and the mountains of the United States, the golden-crowned breeding somewhat farther south in the East than its relative. Both are commonly seen in small companies on migration, and in many sections are winter residents, especially the golden-crowned species.

KING PHILIP, or METACOMET (? -1676). Blood was shed between the white men of Rhode Island and the Indians because of the hatred King Philip, chief of the Wampanoag Indians, felt for the settlers. Unlike his father, Massasoit, who had lived in peace with the white men, Philip distrusted them. Defeated, he hid himself in a swamp near Mount Hope, where he was killed by another Indian. Philip's Indian name was Metacomet.

KINGS, Books of. Two books in the Old Testament of the English Bible are devoted to the history of Israel under the kings. In the original Hebrew canon, the book is a single volume; but in both the story begins with the close of King David's reign and goes to the capture of Jerusalem and the destruction of the temple. Much of the material is duplicated in *Chronicles I* and *II*. See Chronicles.

KING'S MOUNTAIN, Battle of. General Cornwallis' forces were so weakened by the Battle of King's Mountain, fought on October 7, 1780, against a band of American frontiersmen, that Nathanael Greene later was able to hold the South for the colonies. Leading the Americans against the British detachment under Colonel Patrick Ferguson were James Williams, John Sevier, and Isaac Shelby. The Americans accomplished the victory by storming the British entrenchments on the summit of the hill called King's Mountain. One hundred and nineteen British soldiers were killed; 123 were wounded, and 664 were taken prisoner. The Americans lost only twenty-eight killed and sixty-two wounded.

KING WILLIAM'S WAR. See French and Indian Wars.



Acme

EMPIRE'S POET—RUDYARD KIPLING

KIP'LING (Joseph) Rudyard (1865-1935). Few modern minstrels who sing of the glory of England have been able to match the forceful, patriotic, and proud lays of Rudyard Kipling, who, more than anyone else, has vividly pictured the might of the British Empire in his poems and novels. Nor has anyone been able to capture the romance and charm of the Orient and put it as well as he into popular and stirring language. Though Kipling often turned his attention to other fields, it was in the life of the British soldier and the colorful East that he exerted his strongest talents. We may thrill to the adventures of the sea in his *Captains Courageous,* but it is in *Gunga Din, Kim, Tommy,* and *Mandalay* that we find Kipling at his best.

Kipling's love for the East and his knowledge of the practical workings of the British Empire came naturally, for he was born in Bombay, India. After being educated in England, he returned to India, where he joined the staff of the *Civil and Military Gazette* at Lahore, and, later, the Allahabad *Pioneer.* By the time he was twenty-seven, he was already well known for his writings, and while on a tour of the United States he married Miss Caroline Starr Balestier in 1892, and lived at Brattleboro, Vt., for several years. In 1896 he left America, returned three years later, visited South Africa, and finally made his home in England, where he lived until his death in 1935.

Besides *Kim,* some of his best stories of India are *Plain Tales from the Hills, The Phantom 'Rickshaw, Jungle Books, Soldiers Three, The Seven Seas,* and the *Just-So Stories.* In comparison to the realistic qualities of some of these books, he wrote such whimsical tales as *The Brushwood Boy* and *They.* Two poems that gave him the unofficial title of "Laureate of the Empire" are *Recessional* and *The White Man's Burden.* Some of his other books are: *Departmental Ditties, Traffics and Discoveries, Actions and Reactions, The Light That Failed, Wee Willie Winkie, The Five Nations,* and *Puck of Pook's Hill.*

Kipling was awarded the Nobel Prize for Literature in 1907; but strangely, he was never appointed to the cherished post of poet laureate.

KITCH'ENER, Horatio Herbert, Earl Kitchener (1850-1916). England's "strong man" in three great wars, Earl Kitchener, famous British military leader, began his army career in Cyprus and Palestine shortly after his graduation from the Royal Military Academy at Woolwich in 1871. He spent several years in active service in Egypt, aided in the reorganization of the army there, and in 1892 he became commander of the Egyptian forces. Kitchener's first great campaign was directed against the Mahdists, which ended in 1898 with the capture of Khartoum. For this achievement he was made Baron Kitchener of Khartoum.

KITCHENER OF KHARTOUM

At the outbreak of the Boer War in 1899, Kitchener was chief of staff to Lord Roberts and later became commander in chief when Roberts returned to England. After the close of this campaign, Kitchener served his country as military leader in the East Indies, in India, and in the Mediterranean, and in 1911 was appointed consul general in Egypt. He reached the peak of his career when he was given supreme command of the British forces as Secretary of State for War in 1914. He had previously been created an earl.

Kitchener fully realized the magnitude of the task of preparing an army for a war which he believed would last at least for three years. At the time of his death, he had trained and equipped an army of 5,000,000 soldiers. In May, 1916, he embarked on a military mission to Russia. The *Hampshire,* on which he sailed, struck a mine off the West Orkney Islands and all on board were lost.

KITE. Related to the hawks, eagles, and falcons, the kites are noted for their power of flight. Borne by their long, pointed wings, these birds of prey soar high in the air, wheeling and gliding with grace and ease. Four species of kites are found in the United States, the *Everglades,* the *Mississippi,* the *white-tailed,* and the *swallow-tailed.* All are confined largely to the South. The last, however, has been found as far north as Minnesota during the summer, and very occasionally in Ontario and Manitoba. It is about two feet long and pure white in color except for the wings, back, and tail, which are purplish black. Kites live chiefly on insects, reptiles, and frogs, and one species also feeds on snails.

KITES. The modern airplane that flies thousands of miles in only a few hours is a direct descendant of the kite, a flying device that takes its name from the soaring bird of prey (see KITE). No one seems to know just when the first kites were used. Tradition has it that they were originated by Archytas of Tarentum about 400 B. C., but certain tribes in New Zealand have used them from time immemorial. For hundreds of years, kite flying has been an art and a national pastime with the Chinese, Koreans, Japanese, Malays, and East Indians.

The ninth day of the ninth month is "Kites' Day" in China, a day when men and boys of all classes and ages fly kites of unusual design. No nation has carried the kite-making art to a higher point than the Chinese, for they make kites in the form of grotesque dragons, flying fish, birds, butterflies, and dozens of other fantastic forms. Some of these have found their way into the shops of America. Many of the Oriental kites carry a form of bamboo whistle, creating a weird sound designed to drive away evil spirits.

Kites in the past have been more than mere playthings. They have been used in bridge building to carry the first strand of cable across the river, forming the nucleus of the bridge. Before the airplane, they were extensively used for aerial photography and for weather predicting. Benjamin Franklin made use of a kite in carrying on his experiments in static electricity in 1752. Kites have been used in some forms of advertising. The Japanese made use of them over 600 years ago to carry spies over the enemy line, enabling them to determine the strength of the foe. Kites have even been used to carry torpedoes over the enemy lines, allowing an army to shell its foe without risking any of its own men.

KNIGHT, *nite.* See CHIVALRY.

KNIGHT'HOOD, ORDERS OF. To be elected to one of the great organizations of knights is still an honor sought by outstanding military and civil leaders in Europe. These organizations, called *orders,* today are merely honorary, although during the Crusades there were some powerful groups which owned property and had special rights. These were the Templars, Hospitalers, and Teutonic Knights.

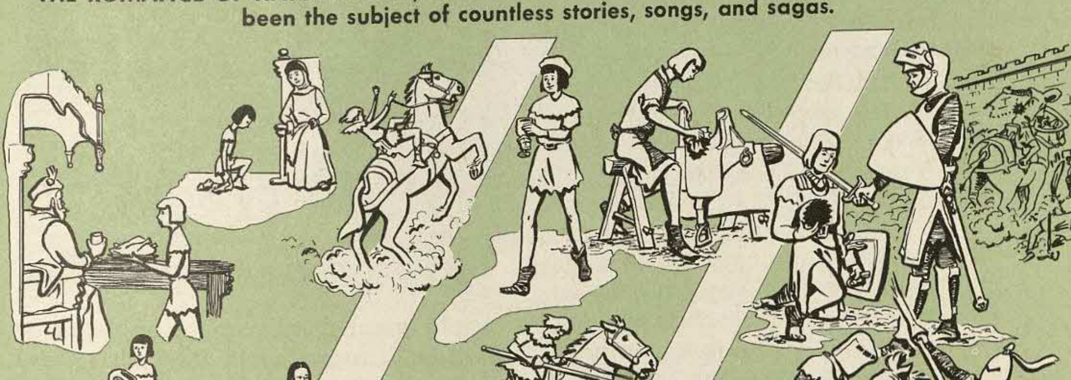
One of the most famed orders is the English Order of the Garter. Founded originally between the years 1346 and 1348 by Edward III and dedicated to Saint George, it has continued to the present day. Some authorities believe it had its source in the jousts waged between the king and his son, the Black Prince, each in command of twelve knights, and that these knights were honored by being allowed to sit on either side of the king at court.

Its emblem is a blue garter, fringed with gold, on which is written, *Honi soit qui mal y pense* (Shame to him who thinks evil). A story has come down that once at court a lady dropped her garter on the floor. While the courtiers tittered, Edward picked up the garter, placed it on his arm, and danced with her, thus making it a dignified occasion. Women may belong to this order as well as men.

Another well-known British order is the Order of the Bath, founded by George I in

"Knights of the Round Table," a Metro-Goldwyn-Mayer Picture

THE ROMANCE OF KNIGHTHOOD, OF HANDSOME KNIGHTS and beautiful princesses, has been the subject of countless stories, songs, and sagas.


A PAGE IS TRAINED
A SQUIRE SERVES ...AND LEARNS
A KNIGHT IS BORN ...FOR COMBAT ON THE FIELD OF HONOR

MELLOW TRADITION
Knighthood today is an honorary position, but the military orders with which it began in the Middle Ages are still preserved. Left, the Chapel of Henry VII in Westminster Abbey, showing banners and stalls of the Knights of the Bath. Below, the origin of the Order of the Garter: King Edward III, 1350.

1725. Its membership is limited to the sovereign, royal princes, a few distinguished foreign persons, and a number of civil and military men who have distinguished themselves in some way.

On the continent by far the most important order is that of the Golden Fleece. Why it is so-called is not known, having been founded by Philip the Good, Duke of Burgundy, January 10, 1429, on the day of his marriage to Isabella of Portugal. The members of this order were consulted on wars, and they could censure the king and try any of their members for certain offenses. Until 1700, the order was headed by the king of Spain, but in that year Charles VI became head, and two divisions, the Austrian and Spanish, have since existed. The Austrian branch allows only Catholics, while the Spanish branch permits Protestant members.

Other noted orders in Europe are the Order of the Holy Ghost, Order of Saint Michael, and French Legion of Honor. Others in England include the orders of the Thistle, Saint Patrick, Saint Michael and Saint George, Star of India, and Indian Empire. All have their various badges, jewels, ribbons, stars, and collars. See CHIVALRY.

KNIGHTS OF COLUMBUS. Founded in 1882 at New Haven, Conn., the Knights of Columbus constitutes a fraternal organization with membership limited to men of the Catholic faith. The ruling body of the group is a supreme council and is selected by the various state councils. The Knights has members in the United States, its possessions, Canada, the Philippines, and Latin America.

KNIGHTS OF PYTHIAS, *pith' ih as.* A fraternal organization, the Knights of Pythias was founded at Washington, D.C., in 1864. The name of the order is derived from the story of Damon and Pythias, and the members are pledged to aid one another. In addition, the society aids others and encourages high standards of morality. It has members in the United States, Canada, and Hawaii.

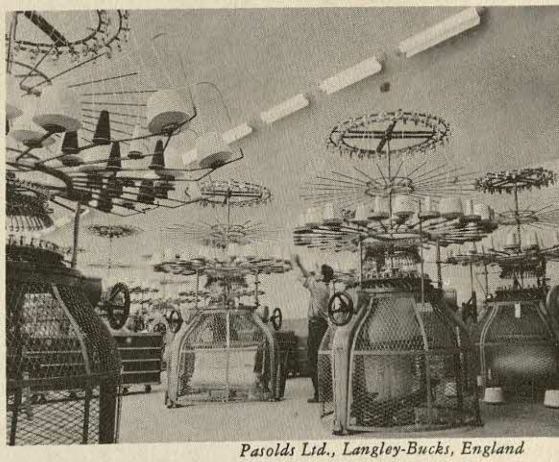
KNIGHTS OF THE BATH. See KNIGHTHOOD, ORDERS OF.

KNITTING, *nit' ing,* **MACHINE.** In 1589 there was invented at Calverton, England, a knitting machine that was destined to lay the foundation of a great new industry. The inventor, a poor clergyman named William Lee, did not live to see his invention put into use, for he was refused the exclusive patent rights. He moved to France and died in obscurity, but his brother improved the machine, and machine stocking making had leaped into prominence in England by 1640. Today the knitting industry not only provides employment for the thousands engaged in manufacturing gloves, hosiery, sports clothes, underwear, and other garments, but indirectly furnishes work for thousands of others who provide the industry with silk, rayon, cotton, and woolen yarns.

The circular, or rotary, knitting machine is the one commonly in use in the modern factory. This machine, which knits a circular web, has needles arranged in rows around a horizontal circular frame. Each needle has a hook at the end, which draws down the thread and leaves a loop as it is released. This loop then slips off the hook and becomes a part of the web as the next hook is joined to it. The needles are erect and have a vertical motion. The web, as it is woven, extends downward within the circle, where it is held in position by a weight. So perfectly adjusted and almost entirely automatic are these machines that one woman can attend to the operation and needs of four of them without trouble.

Used for hosiery, underwear, and other knit garments, these devices have resulted in greatly reduced costs of such apparel. Considerable competition is given the knitting mill by women who prefer to knit their own garments at home for pleasure, economy, and individual style. See TEXTILE; INDUSTRIAL REVOLUTION.

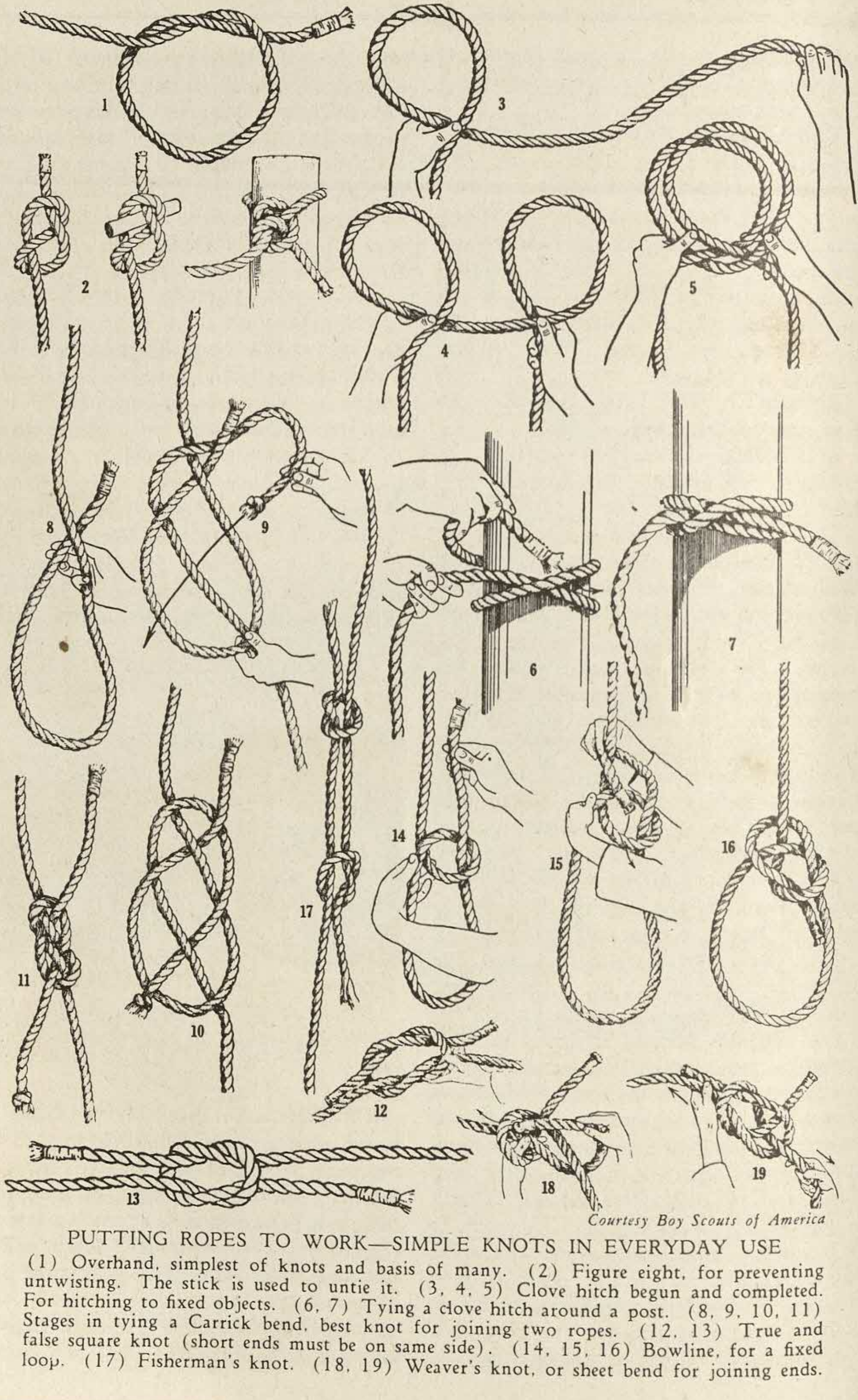
KNOT, *not.* The unit of speed of boats traveling through the water is the knot. For instance, a boat doing ten knots is traveling at a speed of ten nautical miles per hour. A nautical mile is 6,080.27 feet or about 1.15 statute miles. The speed of sailing vessels is determined by means of the log (see LOG), that of ocean liners by the number of revolutions of their propellers, after certain allowances are made.



Pasolds Ltd., Langley-Bucks, England

BUSY NEEDLES IN A RING
High speed machines knit underwear fabric.

KNOTS. Like first aid, the tying of knots is an art that should be learned by everyone. Whether your hobby is boating, hiking, motoring, climbing, or camping, there is sure to come a time when a knowledge of knots will be useful. To the sailor, of course, knot tying is an important part of his work. In trucking, farming, and moving heavy machinery, a knowledge of knots is indispensable. The Boy Scouts



Courtesy Boy Scouts of America

PUTTING ROPES TO WORK—SIMPLE KNOTS IN EVERYDAY USE

(1) Overhand, simplest of knots and basis of many. (2) Figure eight, for preventing untwisting. The stick is used to untie it. (3, 4, 5) Clove hitch begun and completed. For hitching to fixed objects. (6, 7) Tying a clove hitch around a post. (8, 9, 10, 11) Stages in tying a Carrick bend, best knot for joining two ropes. (12, 13) True and false square knot (short ends must be on same side). (14, 15, 16) Bowline, for a fixed loop. (17) Fisherman's knot. (18, 19) Weaver's knot, or sheet bend for joining ends.

consider knot tying so important that Scouts must master a certain group of knots before they can advance to a higher class. Even in the home, a knowledge of knots is an asset; large packages often have to be tied and shipped.

Knots vary from the simple to the very technical; but, in general, all useful knots have two requirements—they must hold firmly without slipping or jamming and they must be easily untied after the strain on the rope is released.

Kinds of Knots. Following are a few simple knots and their uses:

Figure-of-Eight: To keep a rope from running through an eyelet.

Square Knot: Used for joining pieces of rope together. The harder the pull, the firmer the knot. Easily untied.

Fisherman's Knot: Used by fishermen for joining strands of gut.

Slip Knot: A common knot for forming a noose. Ideal for pulling cars, tree climbing, and lassoing.

Two Half-Hitches: Used for tying a rope to a pole.

Clove Hitch: The most useful of all hitches; easy to untie. Ideal for tying a boat's painter.

Bowline: An important slipless knot used for lifesaving purposes and for tying up horses and boats.

Sheepshank: A splendid knot for shortening a rope without cutting or doubling it.

Blackwall Hitch: Used on a hook where a constant tension is provided. The simplest of all knots.

KNOW-NOTHINGS. The members of a political party which became prominent about 1852 were called Know-Nothings because they refused to comment on what occurred at their meetings. The proper designation of the organization was American party. See POLITICAL PARTIES IN THE UNITED STATES.

KNOX, *noks,* JOHN (about 1505-1572). When John Knox, famous religious figure and the founder of Scottish Presbyterianism, took up the cause of the Reformation, he became one of the most hated as well as most revered men in Scotland. Born in or near Haddington, Knox first became interested in the Reform faith in 1542, and in 1547 he fell afoul the French at Saint Andrew's Castle, where he and other Protestants had fled after the murder of the Catholic Cardinal Beaton. The French captured the castle, and Knox was imprisoned in the galleys for nineteen months.

Released in 1549, he was made chaplain to Edward VI two years later. When Mary of Guise came to the throne in 1554 as regent for her daughter, Mary, Queen of Scots, Knox fled to Geneva. There he preached in the English churches, but soon he returned to England. He went back to Geneva the following year, however.

In 1559 Knox joined the Scottish lords of the congregation and began his preaching. His oratory was fiery, and at Perth he so incited his hearers that a riot developed in which some of the city's churches and monasteries were either destroyed or badly damaged. Later made the minister of Edinburgh, Knox from that time became the spearhead of the Reformation movement in Scotland and England

QUAINT ARBOREAL MARSUPIAL
The koala's cry is like that of a distressed child

and had an important share in drawing up the confession of faith which was adopted by Parliament in 1560. His most famous controversy occurred in 1561, when he became involved with Mary, Queen of Scots, over her attempts to establish Catholicism. Knox retired to Saint Andrews in 1570, and two years later removed to Edinburgh, where he died. See MARY STUART.

KOALA, *ko ah' lah.* A furry little "teddy bear" come to life is the Australian koala. Sometimes called the *native bear,* the koala is not a member of the bear family but is a marsupial. Covered with short, gray fur, it roams at night and feeds on leaves, especially those of the eucalyptus tree. Its toes are arranged in groups of two and three, enabling it to hang easily from branches of trees. The female carries her young in a pouch, kangaroo fashion. The koala is rapidly dying out and is rigidly protected, its capture or export being prohibited by law.

KOCH, *koke,* ROBERT (1843-1910). The ability of medical science to control the ravages of disease was much advanced by the studies of Robert Koch, eminent German bacteriologist and winner of the Nobel Prize for Medicine in 1905. Both human beings and animals have greatly benefited from his investigations.

Born in Klausthal, Hanover, Koch received his degree in medicine from the University of Göttingen. After establishing a private practice, he became interested in the bacterial causes of various infectious diseases. His greatest discovery came in 1882 when he isolated the bacillus which causes tuberculosis. Although he developed a tuberculin which aids in diagnosing the disease, he was unable to find a cure. Previous to this, in 1875, Koch had discovered a means of preventing anthrax by inoculation.

In 1883 Koch went to Egypt to study Asiatic cholera and there discovered the bacillus which causes the disease. His other investigations included valuable studies for the control and treatment of African rinderpest in cattle, sleeping sickness, malaria, and bubonic plague. See BACTERIA AND BACTERIOLOGY; GERM THEORY OF DISEASE.

KON'GO. See CONGO.

KORAN, *ko rahn',* or *ko'ran,* **or ALCORAN.** The sacred book of the Mohammedans which is comparable to the Bible of Christians and Jews is the Koran. It includes not only precepts for the conduct of a Moslem's moral and religious life, but also rules for the conduct of civil life.

Mohammedans believe that the Koran was first written on a huge tablet located in the heavens, and that an angel, who is sometimes called Gabriel, communicated certain portions of it to the Prophet Mohammed every twenty-three years. Mohammed then had these fragments written down for the use of his followers. When the Prophet died, the writings were collected in one volume at the order of his successor, Abu Bekr; but because this copy of the Koran was supposed to contain several unauthentic passages, Caliph Othman in A. D. 652 had the original Koran copied and then all other copies destroyed. Work then began on an authoritative version.

The principal doctrine of the Koran is in the words, "There is but one God and Mohammed is his Prophet." God is considered as the all-powerful, all-seeing master of the universe. Several characters from the Christian religion, such as Moses, Noah, and Christ, are accorded the places of saints in the Koran and are given a place in the seventh heaven, the nearest to God. The Koran also states that God's mercy and not man's merits will admit the believer into heaven. Idol worship is forbidden. Prayer is prescribed five times a day with the head bowed toward Mecca, the holy city; the body must be purified with water or dust or sand before the prayers are said. Almsgiving was made an obligation by the Koran. See MOHAMMED; MOHAMMEDANISM.

KORE'A. See CHOSEN.

KOSCIUSKO, *kahs i us'ko* (Polish pronunciation, *kosh·chyoosh' ko*), THADDEUS (1746-1817). Honored by Americans and

Poles alike for meritorious service to both countries, Thaddeus Kosciusko, Polish military leader, fought with the American colonies in the War for Independence. Born of noble family, he received his military education in Warsaw and in France and was made a captain in the Polish army. Coming to America in 1776 with letters of introduction from Benjamin Franklin, he was appointed a colonel of artillery by Washington and was later made a brigadier general.

Upon his return to Poland, Kosciusko soon discovered that his own country needed his services in the wars against Austria, Russia, and Prussia, which were dividing Poland among themselves. Made a general of the insurgent forces, Kosciusko defeated the Russian army at Raclawice, near Cracow, in 1794. In a later battle at Maciejowice, his army suffered defeat, and Kosciusko was taken prisoner. Released in 1796 by Paul I of Russia, he spent the remainder of his life in France, after short visits to America and England.

KOSSUTH, *kosh' oot,* Louis (1802-1894). A Hungarian patriot, Louis Kossuth played an important part in his country's struggle for freedom from the Austrian Hapsburg kings. In 1848 he led a revolt against Austria and succeeded in establishing a republic, of which he became governor. He soon resigned in favor of Gorgei, however, as a necessary means of maintaining the unity of his followers.

Austria crushed the republic in 1849 with the aid of Russia, and Kossuth fled to Turkey, where he was held. He was later released because of the intervention of the United States and Great Britain. In 1867, when the Dual Monarchy of Austria-Hungary was formed, he could have returned to Hungary but preferred to remain in exile. He died at Turin, Italy.

KREISLER, *kri'zlur,* Fritz (1875-). Internationally famous as a concert violinist and a composer, Fritz Kreisler made his first American tour at the age of fourteen. He began his study in Vienna, his birthplace, under Leopold Auer and Hellmesberger. Young Kreisler showed marked ability on the violin, winning a gold medal at the age of ten, and two years later the Prize of Rome at the Paris Conservatory. Kreisler served as a captain in the Austrian army during World War I. At the outbreak of World War II, he went to the United States and in 1943 became a naturalized American citizen.

LIBERAL HUNGARY'S HERO
Louis Kossuth, who led Hungary's revolution.

KRUPP, Friedrich Alfred (1854-1902). Successor to Europe's largest factory for the manufacture of war materials, Friedrich Alfred Krupp took over the direction of the great Krupp munitions works at Essen, Germany, on the death of his father. He greatly expanded the works and made two important contributions to the industry in a new Bessemer steel process and a method for hardening armor plate. He was famous for his fair dealings with his employes, providing them with scientific housing and pension benefits.

Upon his death his daughter Bertha assumed management of the works. After her marriage, in 1906, her husband, Dr. Gustav von Bohlen, became manager and took the name Krupp von Bohlen und Halbach. The Krupp plant was badly damaged by Allied bombs in World War II, and after the war Von Bohlen was indicted as a war criminal.

KRYPTON, *krip'ton.* Like the other rare gases of the atmosphere, the gaseous chemical element krypton is inert; that is, it does not combine with other elements. It is colorless, odorless, and tasteless and occurs in air in very minute quantities. Discovered by Ramsay and Travers in 1898, it has been liquefied and solidified. Similar to neon, it is used in certain electric lamps. Its symbol is *Kr.*

KUBLAI KHAN, *koob ly kahn',* more properly, KHUBILAI KHAN (1216-1294). Culture and learning were at their height in the vast Mongolian empire under Kublai Khan. It was his court that was visited by the European explorer, Marco Polo, and it was the marvelous accomplishments of his reign that were described to Western traders by Polo upon his return.

Kublai Khan became emperor of the Mongols in 1259 and soon had conquered Northern China. Eventually he ruled all China. During his reign beautiful palaces were built, marvelous jewelry and ornaments were cut and manufactured, paper money was circulated, and learning flourished. It was his ambition to set up trade and exchange ideas with Europe, but despite Marco Polo's mission with this plan in mind, it was not accomplished.

KU KLUX KLAN. During the period of reconstruction following the American Civil War, a secret society called the Ku Klux Klan was formed. Its purpose was to intimidate and hold in check the recently freed Negroes. When first organized, it contained many prominent disfranchised Southern citizens who believed that by instilling fear into the former slaves they could curb their political activities directed by unscrupulous Northern politicians, called *carpetbaggers.* Members of the organization wore disguises of flowing white robes and usually carried on their activities at night, riding in groups through the Negro areas, burning large wooden crosses as warnings, and sometimes committing grave offenses. At its height the Klan had thousands of members, but by 1872 the government succeeded in passing legislation to break up the organization.

From the tradition of the first Klan there arose a new one in 1915, which within a few years attained a large membership. Spreading all over the United States, this society was widely denounced for its opposition to non-whites, Catholics, Jews, and others. It was officially dissolved in 1944.

KUMQUAT, *kum'kwot.* Of Chinese or Japanese origin, the kumquat is now grown in the Florida, Gulf-coast, and California citrus regions. The trees that bear this small fruit are shrublike in growth, with evergreen leaves, and look much like other citrus fruit trees, such as the orange. They are valued as ornamental plants as well as for their fruit. The flowers are small, white, and sweet-scented. The fruit is round or oval, like an olive in size, but like an orange in structure and color. Fruits are sold for the holiday trade, and the sprays of fruit and leaves are decorative. The entire fruit, including the rind, is eaten. The fruit is also preserved, crystallized, and made into marmalade.

KURIL, *koo'ril,* **ISLANDS.** Covered with thick vegetation and bamboo forests, the Kuril Islands extend in a chain from Kamchatka to Yezo, an island of Japan. The Japanese name for the islands is Chishima. The group is composed of more than thirty islands of volcanic origin, but only eight are important. They were discovered by the Dutch in 1634, but later they came under the control of Russia. In 1875 Russia traded them to Japan for half of Sakhalin Island. Japan lost them as a result of her defeat in World War II. The population is about 3,000.

KUROSHIO, *koo'ro she' o,* **or JAPAN CURRENT.** Washing the shores of Formosa and Japan is a warm ocean stream known as the Kuroshio. It is about ten degrees warmer than the usual temperature of the sea, although it is colder than the Gulf Stream. It flows northward to the Aleutian Islands and then turns southward to the west coast of the United States. See OCEAN CURRENTS.

L. The letter *L,* the twelfth in our alphabet, was written by the Phoenicians like this (. The Greeks took out the curves, turned the letter around, and wrote it 1 or J ; later they wrote it λ or V . The Romans, when they adopted the letter, wrote it *L,* as we do today.

LABOR, DEPARTMENT OF. With the recent growth of labor problems, the Department of Labor, an executive division of the United States government, has become increasingly important. The Secretary of Labor, who heads the department, is a member of the President's Cabinet.

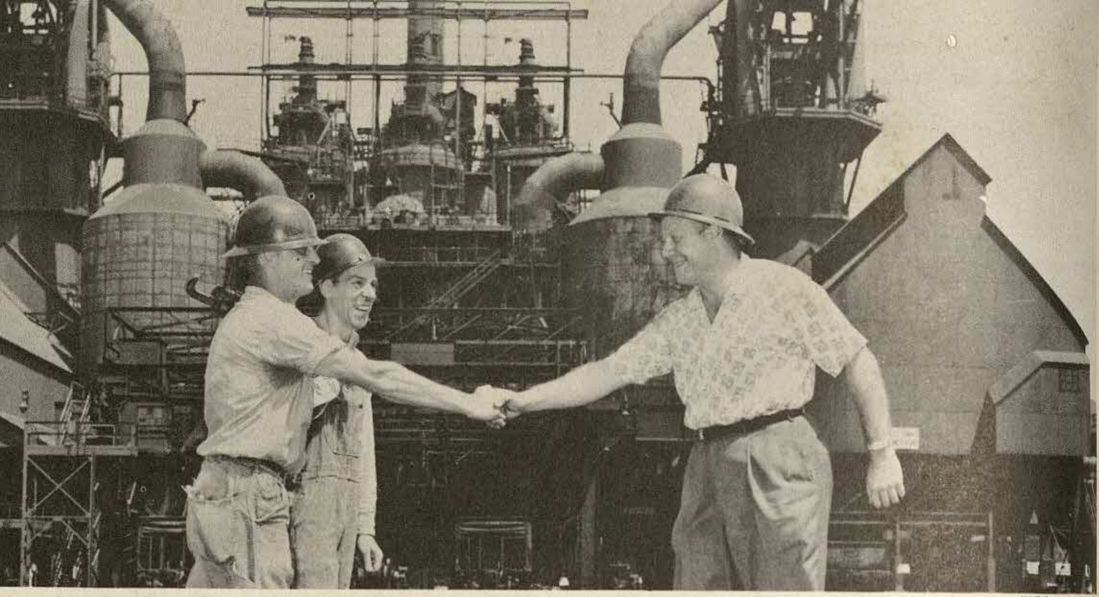
The original purpose of the department, which had its beginning on March 4, 1913, is to look after "the welfare of wage earners, improving their working conditions, and advancing their opportunities for profitable employment."

Included in this department are the Bureau of Apprenticeship, the Bureau of Labor Statistics, the Office of International Labor Affairs, the Women's Bureau, the Bureau of Labor Standards, and the Wage and Hour and Public Contracts Divisions. When the department was established, the Secretary of Labor was empowered to mediate labor disputes, but in 1947 all mediation and conciliation functions were transferred from the Department of Labor to a new independent agency, the Federal Mediation and Conciliation Service. The department also publishes reports and bulletins. See CABINET; LABOR LEGISLATION.

LABOR, DIVISION OF. In modern industry each worker has some one certain task to perform, something which he does day after day until he becomes expert in doing

ORGANIZER FOR THE NATION'S WORK

The Department of Labor is housed in this building on Constitution Avenue in Washington. It adjoins the quarters of the Interstate Commerce Commission.


UPI

MEN AND MACHINES—TEAMWORK THAT PAYS OFF
Labor, management, and modern equipment build industrial strength.

that thing. He does not produce an entire article; instead, he performs only one step in its manufacture. This system is called division of labor.

Until about two generations ago, one man made an entire suit or a pair of shoes or built a house. Each step in the making took considerable time, and, as a rule, the finished product was good. But "practice makes perfect"; and when a person performs only one certain task, time and again, he develops efficiency and speed. As needs and competition increased after the Industrial Revolution, the individual artisan could not produce the quantity of goods needed. This situation brought about a change in labor methods, and under one roof was housed a large group of workmen each of whom specialized in some one process. Thus the modern factory developed.

Now a workman may have little or no knowledge of what other workmen are doing. Perhaps it is his job only to screw a single bolt into a wheel of a partially complete automobile passing from workman to workman on a conveying belt. It has been estimated that specialists are able to accomplish five times as much work as a single, all-around artisan.

From the standpoint of production, quantity, economy, and quality, division of labor has merit. However, there are arguments in opposition—that it tends to make machines of men, destroying their initiative and individuality. The all-around worker with his hopes for advancement and perhaps ownership of a business of his own is rapidly disappearing.

Division of labor has produced two kinds of general labor, skilled and unskilled. The former group performs the more difficult tasks which require experience and skill, and the latter is engaged in menial work. See INDUSTRIAL REVOLUTION; LABOR ORGANIZATIONS.

LABOR DAY. Originated by the Knights of Labor in 1882, Labor Day is now observed in Alaska, the United States, and Canada in honor of organized labor. Congress has legalized the holiday only for the District of Columbia, but most states have followed suit either by law or proclamation. Most places observe the day on the first Monday in September. In Europe, May 1 is the traditional date for labor celebrations. The day is usually marked by parades, meetings, and other demonstrations in the interests of organized labor.

LABOR LEGISLATION. Laws that concern the welfare of workingmen are classified as labor legislation. After 1900, a realization that there was a definite advantage to both labor and management in short hours, good working conditions, and reasonable pay strongly influenced the movement for this type of law. Progess had been made in labor legislation during the nineteenth century in England and Germany. A labor movement in the United States was making gains at the same time. Definite advances in labor legislation, however, did not come until the administration of President Wilson.

The passage of the Clayton Act in 1914 did away with the idea that labor was a commodity when it exempted labor unions from prosecution under the antitrust laws. The Sherman Act (1890) had been used against unions but under the Clayton Act it was held that antitrust legislation concerned goods rather than the people who produced them.

The Clayton Act stated that nothing in such legislation should be interpreted as forbidding "the existence and operation of . . . labor organizations." The law forbade the use of injunctions in labor disputes, but this weapon, a court order forbidding action of some kind by someone, was used against strikes until the passage of the Norris-LaGuardia Anti-Injunction Act of 1932. This law was more clearly worded than the earlier Clayton Act and was more effective in preventing court injunctions in favor of employers.

Labor legislation was further advanced during the Wilson administration by passage of the Adamson Act of 1916, which assured an eight-hour day for railroad employees. The movement for shorter hours grew stronger after World War I. In 1910, the average week of the American working man was fifty-four hours. In Europe, it was sixty hours. The figures were forty and forty-eight hours, respectively, in 1950.

The National Recovery Act was passed in 1933. It provided for the elimination of child labor, the establishment of maximum hours and minimum wages, and it gave labor the right to bargain collectively through its union representatives. The law was declared unconstitutional in 1935 but was replaced the same year by the Wagner Labor Relations Act.

The Wagner Act carried on the protection of collective bargaining and forbade unfair practices by employers. The National Labor Relations Board was established to carry out the provisions of the Wagner Act, which were upheld by the Supreme Court in 1937.

The Social Security Act of 1935 provided old age pensions and unemployment insurance. The Wages and Hours Law of 1938 provided a minimum wage which has been raised as living costs have risen.

The large number of labor strikes during World War II led to passage of the Taft-Hartley Labor-Management Relations Act in 1947. This law replaced the Wagner Act and was passed over President Truman's veto. The act gave greater freedom to management. Unions were required to give advanced notice of strikes. The closed shop was outlawed and union shops were permitted only where they had been voted for by a majority of the employees. The NLRB was retained and labor kept its right to bargain collectively. Both employers and unions were forbidden to contribute to political campaigns. See CHILD LABOR; OLD AGE PENSIONS; WORKMEN'S COMPENSATION.

LABOR ORGANIZATIONS. With the increased complexity of the modern industrial system, workers have found organizations of their own making valuable in securing mutual benefits and protection. Today large numbers of workingmen belong to some kind of organizaion.

Labor organizations recognize the fact that since the means of production are not owned by the worker, the worker must protect his own interests. They also recognize the fact that safe and sanitary working conditions are necessary, and seek to secure them when the employer does not voluntarily provide them.

When businesses are small, the employer and the employe are able to talk things over, man to man. Large industries tend to separate the worker from his employer; and the worker finds that his voice, alone, carries little influence. Acting alone, he has no alternative to accepting the terms offered by a remote employer. When an organization speaks for him, however, the mass voice carries considerable weight.

Much of the legislation providing for workmen's compensation, unemployment insurance, old-age pensions, length of working day and week, and regular state factory inspections for sanitation and safety, as well as laws regulating labor of women and children, have been brought about through agitation by labor organizations. Once remote from politics, unions today exercise great influence and are able to secure many demands.

Types of Organizations. What type of labor organization is the most satisfactory has long been a question. In general, there are two types of unions, the *horizontal* and the *vertical*. In horizontal unions each particular craft or trade is organized separately. In this type of unionism there is expression of individual trade viewpoints and interests; and each craft, regardless of membership, has an equal voice. The weakness of this type of union lies in its lack of strength in strikes or group demands.

In the vertical union, all the employes of a company or industry, skilled or unskilled, organize into one union. The advantage of this type of union lies in its strength.

Some companies maintain within themselves *company* unions, in which representatives of the employer and employes meet. Another type of labor organization is the *local* union. The members of a local union all work in one city or in one industrial district. The disadvantages of these unions lie in their lack of strength and their possible control by one person.

History of the Labor Movement. Trade unions, as such, first appeared as outgrowths of the old guilds in England during the eighteenth century, but they did not reach America until about 1830. Unionism in America was vertical in form until 1850, when the Typographical Union, a craft organization, came into being. Nineteen years later the Knights of Labor, taking members from all walks of life, was founded. This organization was succeeded in 1886 by the American Federation of Labor, a horizontal type union.

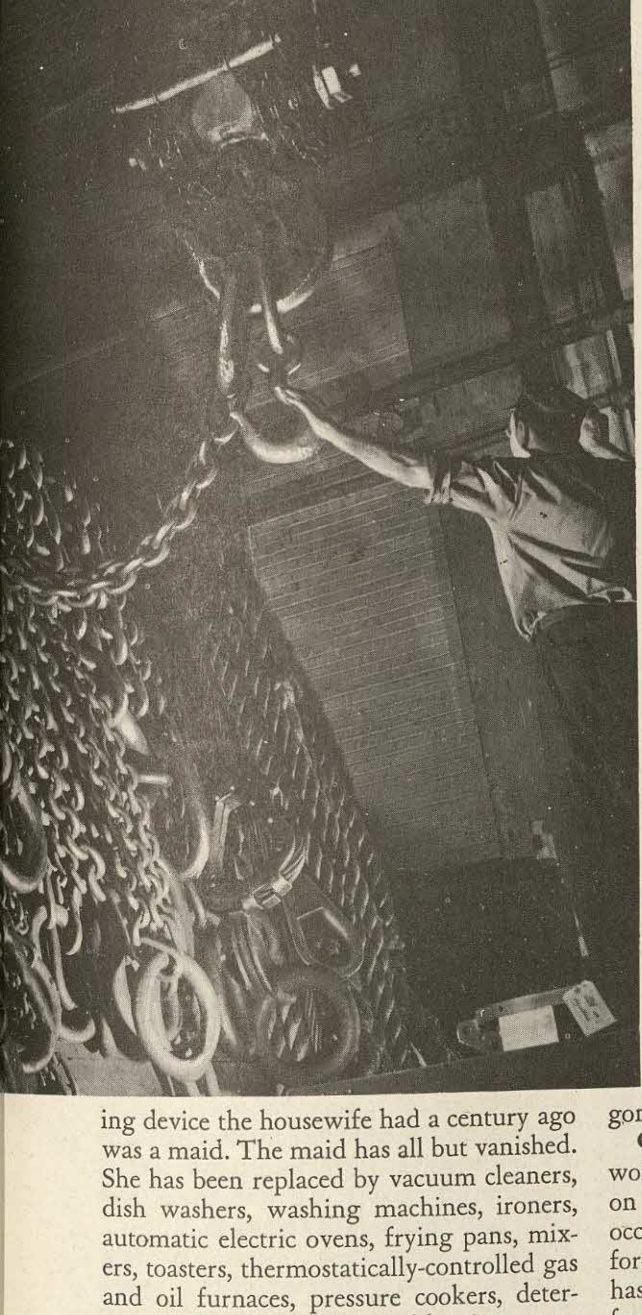
In 1935, John L. Lewis organized the Committee for Industrial Organization within the framework of the A. F. of L. The parent organization expelled the unions comprising the committee, and the latter became an independent organization, adopting the name Congress of Industrial Organization, in 1938. The United Mine Workers withdrew from the C. I. O., a vertical type union, in 1942. In 1955 the C. I. O. merged with the A. F. of L. This action united over 140 unions and about 15,000,000 workers. The advantage of this merger lies in its tremendous strength in any labor dispute. As the first president George Meany became the most powerful labor leader in history. The United Mine Workers and several smaller independent unions remained out of the merger. The labor movement has grown to such an extent that unions now claim over 17,000,000 members. In addition, many nonmembers are governed by union contracts.

Consult the following titles:

Gompers, Samuel
Green, William
Labor, Department of
Labor, Division of
Labor Legislation
Lockout
Open Shop
Strike
Wages

LABOR-SAVING DEVICES. Our ancestors of only a hundred years ago would be amazed to see how greatly labor-saving devices have speeded and lightened the work of the world. They might be even more amazed to see how much work the "labor savers" have created, for labor-saving devices have built many new industries.

In the Home. About the only labor-sav-



International Business Machines Corp.; Westinghouse; REA

WE HARNESS MACHINES TO DO OUR WORK

These are labor-saving devices: above, electric typewriter; left, electric crane; below, portable electric motor for use on the farm.

ing device the housewife had a century ago was a maid. The maid has all but vanished. She has been replaced by vacuum cleaners, dish washers, washing machines, ironers, automatic electric ovens, frying pans, mixers, toasters, thermostatically-controlled gas and oil furnaces, pressure cookers, detergents, self-polishing floor and furniture waxes, ready-to-cook and ready-cooked foods, and other home-labor savers.

What has happened to the maid? She has gone to work for shorter hours at higher pay in factories, stores, and offices—perhaps to help make or sell the very devices that destroyed her old job. Thousands of housewives, relieved of household drudgery, have gone to join her.

On the Farms. About 60 per cent of all workers in the United States were employed on farms a century ago. Farm work now occupies only about 11 per cent of the labor force. The number of farm workers scarcely has changed in the past hundred years, but farm workers now handle three times as large an area as they did then. And they produce five times as much food.

Most of the increase in farm production is a result of labor-saving devices. Scythes, pitchforks, walking plows, and other primitive devices have been pushed into oblivion by powerful, efficient farm machines such as tractors, gang plows that prepare several furrows at a time, mechanical seeders and planters, harvesting machines, and milking machines. Haymaking is done with mowing machines, side delivery rakes, tedders, choppers, balers, automatic loaders, and devices that blow chopped hay into hay mows. The displaced workers have streamed into cities, many of them to help make, sell, or transport farm machines.

In Industry. Labor-saving devices have revolutionized mining, manufacturing, processing, transportation, communications, and office work. The transportation of raw materials and finished products is speeded by trucks, planes, conveyors, elevators, fork lifts, and other devices. Printing machines, telephones, teletype machines, radio, and television save time and labor in communications. Typewriters, duplicating machines, adding machines, and punched-card machines save labor in offices.

Problems. The multiplication of labor-saving devices has caused many tragedies and problems. Many inventions have thrown skilled workers out of jobs. In earlier days, displaced workers reacted violently against the machines that displaced them. The first sewing machines, introduced in France, were taken off the market after people who lived by hand-sewing destroyed the machines.

Automation has been replacing workers with machines. The trend is toward continuous processing plants, such as bakeries, in which the raw materials will be delivered at one end and finished products will emerge from a machine at the other end. Workers will be needed only to start and stop the plants, and to make repairs.

On the other hand, automation itself demands workers to design, make, sell, install, repair, and operate the machines.

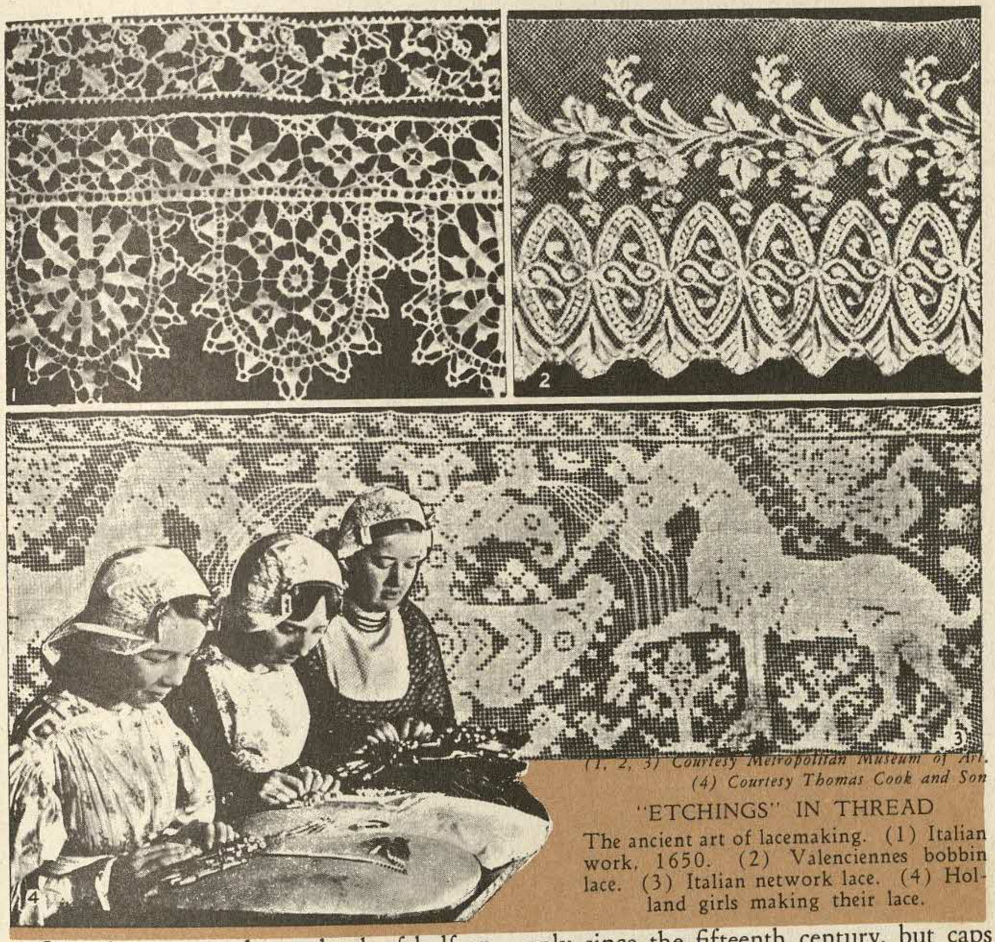
Technological unemployment is the price of technological progress. We are repaid by new types of employment, relief from drudgery, increased leisure, higher pay, and the ability to buy and enjoy things that add to our comfort. Labor-saving devices provide widely used luxury items that once were beyond the command of kings.

LABRADOR, *lab′ ra dawr*. A cold, bleak country, Labrador comprises a section of British North America just north and east of the province of Quebec. It stretches along the Atlantic coast from Hudson Strait to a point opposite the northern tip of Newfoundland. With an area of 110,000 square miles, it is a dependency of Newfoundland. Its scattered population numbers about 10,750 and is made up of Algonquian Indians in the south and Eskimos in the north. There are a few white traders and missionaries. The most famous missionary was Dr. Wilfred T. Grenfell, who died in 1940.

Since summers are too short to grow crops, there is almost no agriculture and foodstuffs must be imported. Hunting and trapping provide the meat supply, the only domesticated animals being the reindeer and the dog, used as beasts of burden. The pine, birch, poplar, and willow trees are found in the southern part of Labrador, but in the north only hardy mosses and lichens grow. See GRENFELL, WILFRED THOMASON.

LABRADOR CURRENT. Sweeping down the coast of Labrador is the cold Labrador Current, which remains a distinct ocean stream until it merges with the Gulf Stream off the coast of Newfoundland. Originating in the Arctic Ocean, it directly affects the climate of Labrador and blocks its harbors with ice for six months of the year. It is also responsible for the heavy fogs in the Newfoundland fishing banks and adjacent territory because its coolness condenses the moisture in the air to form dense fogs. See OCEAN CURRENTS.

LAC, *lak*. An insect, the lac, secretes the substance forming an ingredient of some varnishes, cements, sealing wax, and a certain kind of dye. This insect lives on the twigs of certain trees which it pierces, drawing out the juices as food. Then it secretes a gumlike substance by which it becomes fastened to the twig, where it dies. The eggs of the insect, which have already been deposited on the twig, hatch, and the young dig their way out to go through the same process as the parent lac.



(1, 2, 3) Courtesy Metropolitan Museum of Art.
(4) Courtesy Thomas Cook and Son

"ETCHINGS" IN THREAD

The ancient art of lacemaking. (1) Italian work, 1650. (2) Valenciennes bobbin lace. (3) Italian network lace. (4) Holland girls making their lace.

Sometimes covered to a depth of half an inch, the lac-encrusted twigs, called *stick lac,* are collected, and the substance is scraped off and dissolved in water. Strained through a canvas, the liquid hardens into a commercial material, *shellac,* which is an ingredient of varnishes and cements. The water in which the lac is washed contains a residue called *lac dye,* which is similar to the reddish cochineal.

LACE, *lase.* Consisting of threads looped or plaited together into delicate, weblike designs, lace has long been appreciated as a handsome article of dress by both men and women. Lace differs from embroidery and weaving in that it is made one mesh or loop at a time without the aid of a previously prepared ground fabric or warp. Lace as we think of it today has been made only since the fifteenth century, but caps of plaited thread, of lace-like character, have been found in ancient Egyptian tombs.

When lacemaking first developed as a craft, in the Middle Ages, lace was made by hand and could be worn only by the wealthy. With the invention of the bobbinet machine in 1809, lace was brought within the means of all.

The earliest attempts at lacemaking were in the nature of drawn work in which a part of the threads in a linen fabric were drawn out and those that were left were worked over in various fanciful designs, either with a buttonhole stitch or a simple wrapping stitch. A later development was made by cutting away some of the threads and replacing them with others put in with a needle. This plan was then expanded by doing away entirely with threads which had originally formed part of a piece of cloth, and building up a pattern of new threads laid down in some regular design on a backing of parchment. This pattern was worked over and strengthened with needle and thread until the whole piece of work could be lifted from the parchment without losing its shape.

This was the beginning, in the fifteenth century, of the fabric later known as *point* lace, which changed greatly the styles of dress in Europe. It supplied the women of that time with a means of earning a living, and eventually led to extravagant expenditure on dress. The men of that period, rather than the women, wore lace, and noblemen frequently spent fabulous sums for their lace collars, ruffles, and knee and boot trimmings.

About this time, *pillow,* or *bobbin,* lace was made in Flanders. It is made upon the principle of plaiting or braiding together various threads which have been wound upon small bobbins, and is not made with a needle. A perforated parchment pattern is pinned to a hard, round or oval pillow. The ends of the threads wound on the bobbins are tied together and fastened to the pillow at the beginning of the pattern, and the bobbins are left to hang free. The lace is formed by placing pins into the perforated pattern, twisting the bobbins around the pins, and passing the bobbins over or under each other to form braids or plaits. The groundwork of pillow lace is composed of these plaited or braided threads, the braids so formed being connected to form mesh and pattern by a continuation of the braiding movement.

Laces are usually named from the town or region where their particular kind was developed, as, for example, *Brussels* lace, from Brussels, in Belgium; *Mechlin* lace, from Mechlin (Malines), also in Belgium; *Valenciennes* lace, from Valenciennes, in Northern France; and *Irish point* lace, made in Ireland.

LACE-WINGED FLIES. Gauzelike, veined wings and bright-golden eyes identify this large family of slender green insects. They are fragile-looking creatures with bodies about three-quarters of an inch long. Their larvae, called *aphid lions,* develop from eggs attached to leaves and twigs by erect little stalks, and are beneficial to man because they eat great quantities of destructive plant lice.

LACHRYMAL, *lak' re mal,* **GLANDS.** Located near the upper and outer edge of each eye, the lachrymal glands of the human eye constantly secrete tears as a means of keeping the delicate membranes of the organ moist. These tears, consisting of moisture liberated from the glands, are carried to the inside surface of the upper eyelid by several tiny ducts. The "blinking" of the upper eyelid spreads this moisture over the entire eye, after which the liquid runs off through a troughlike opening in the inner corner of each eye into the lachrymal sac. The sac is connected by a short tube to the back nasal passage.

Grief, joy, or repeated blinking will stimulate the lachrymal glands to greater activity, thus secreting more than the usual amount of liquid. This surplus moisture overflows the lower lid, causing what are commonly called tears. See Eye.

LACQUER, *lak'ur.* To the Western World, lacquer is simply a shellac for covering wooden or metal surfaces (see Lac). True lacquer, however, is made from the sap of the varnish tree, a plant related to the sumacs. The tree is native to China but has been cultivated in Japan for hundreds of years.

The art of lacquering has reached its highest development in China and Japan. Although some of the work is done on metal or porcelain, most of it is done on wood. Such articles as trays, boxes, vases, screens, and even chairs are beautifully lacquered.

In the process of lacquering, the base is given one or two coats of a lacquer composition. Next, a piece of cloth or paper is pasted over the surface. Fine lacquerware then receives from twenty to thirty coats of lacquer, each of which is ground and polished, producing a highly glazed surface. The surface is then ready to be inlaid, carved, or colored. Inlays are made with gold, silver, shells, ivory, jade, and other substances.

Because lacquer produces a hard finish, it can withstand a high degree of heat. People in the Orient frequently use lacquered bowls for hot soups and drinks.

LACROSSE, *la kross.* Similar to hockey, lacrosse is a game widely played throughout Canada and the eastern part of the United States. A fast sport, it requires stamina and speed as well as dexterity and quick thinking.

The game originated with the North American Indians, who played it considerably at the time the French came to Quebec. The French missionaries, not knowing any other name for the sport, called it *la crosse* (crosier) because the stick used was similar to a bishop's crosier. It was taken up by the white settlers, and in 1867 a set of rules was adopted, clubs were organized, and competition in lacrosse spread throughout Canada.

Formerly the ball used by the Indians was made of hide, stuffed with hair or bark. Today, however, it is made of India rubber, and is two and one-half inches in diameter. The stick is crooked at one end, with catgut strings stretched across the opening. The field is usually about 120 yards long, and may be any width. Goals are located at each end of the field. Twelve compose a side, one as *goalkeeper,* another at *center,* three at *defense,* one at *point,* another at *cover point,* three at *attack* positions, one at *out home,* and another at *in home.* Each man, except the *goalie,* covers another on the opposing side.

The game is started at the center of the field with the two centers attempting to scoop up the ball with their sticks. The object then is to run toward the opponent's goal and hurl the ball into the net of the goal. On offense, intricate passes are attempted in an effort to advance the ball, similar to soccer or hockey. On defense, the object is to take the ball away from the opposition. Each goal is followed by another face-off, and the game lasts sixty minutes, divided into halves. The game is extremely strenuous, and injuries are frequent. A player carrying the ball on his stick may be stopped by an opponent's body-check providing the check is not made from behind. If a player is fouled a free throw is awarded.

According to one story, the Indians used to play with as many as 1,000 men on a side. Once a band of Indians approached Fort Michilimackinac (Mackinac), and invited the settlers to watch them play the game. The settlers came out from the fort, but instead of playing lacrosse, or *bagataway,* as the Indians called it, the red men killed all the whites.

United Press

LACROSSE IS FAST AND EXCITING

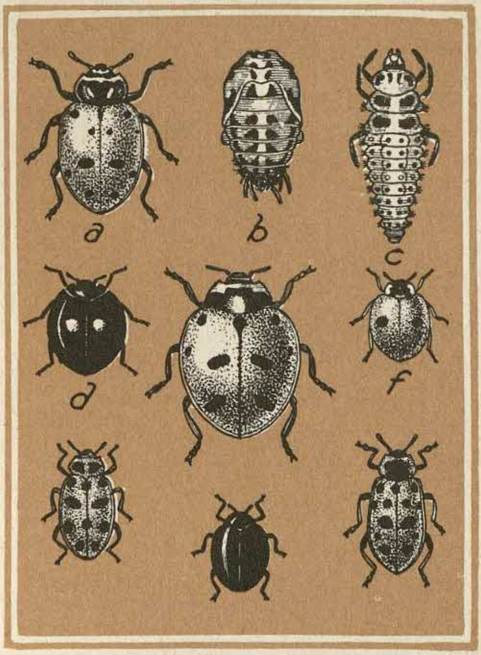
A game related to hockey, lacrosse was originally played by North American Indians. It is a fast, dangerous sport, played with a stick ending in a rawhide network.

LADOGA, *lah' doh gah.* Located between Russia and Finland, Lake Ladoga is the largest lake in Europe, consisting of a total area of 7,000 square miles. Drained by the Neva River, this lake has about seventy rivers emptying into it, of which the Volkhov is the largest. Ladoga is part of a network of canals built in 1935, joining Leningrad with the White Sea in the north.

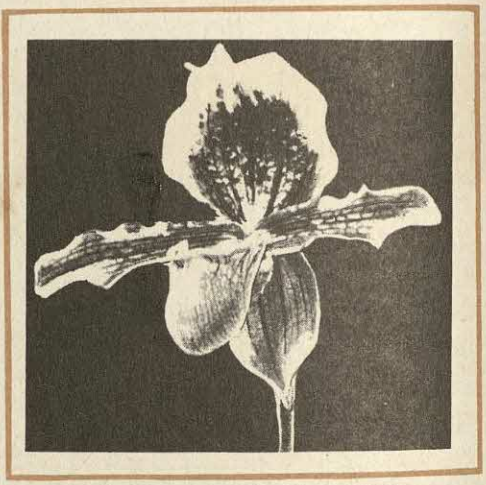
LADRONE' ISLANDS, or MARIAN'A ISLANDS. Lying far out in the South Pacific, mere specks on the map, are the Ladrone Islands. A full 1,500 miles east of the Philippines, or about a third of the way to Hawaii, these islands are of great importance as a coaling station. Largest and southernmost of the group is Guam, belonging to the United States; the other islands of the group were under a Japanese mandate by the Versailles Treaty until 1945.

Volcanic, rugged, and picturesque, they are heavily forested and verdant. Half of the islands are inhabited, chiefly by the Chamorros. Among their agricultural products are coconuts, indigo, rice, maize, tobacco, and coffee. Copra and coconut oil are the principal exports. There are but few insects and reptiles, and no mammals except bats and rats.

Obtained from Spain at the close of the Spanish-American War in 1898, Guam has a population of about 38,000. The other fifteen islands were sold to Germany by Spain in 1899 and have a population of about 78,000. During the First World War, the islands were captured by the Allies. Japan controlled them until her defeat in World War II.



LADYBIRD BEETLES
"Ladybugs" help control destructive aphids. *a, b,* and *c* show adult, pupa, and larva; *d,* twice-stabbed ladybird. Others named according to spots.



GARDEN VARIETY ORCHID
Lady's-slippers make excellent potted flowers.

LADYBIRD, or LADYBUG. Man's feeling of friendship for the ladybird beetles is well justified, for this insect wages constant war against destructive aphids, or plant lice, and scales. Ladybirds are shaped like a hemisphere and are spotted with bright red or yellow. Although some species feed on vegetable leaves, most members of the family are among the farmer's best allies. See BEETLE.

LADY'S-SLIPPER, or MOC'CASIN FLOWER. There are few things in nature more interesting than the way in which the lady's-slipper makes insects assist it. When a bee is attracted to a lady's-slipper, it must enter the sac-shaped lip at the front

Sons of the Revolution, State of New York

THE REVOLUTION'S DARKEST HOUR
Washington and Lafayette make the rounds at Valley Forge with words of cheer and encouragement for the suffering troops.

in order to strike at the stigma. But when it wishes to leave, it finds the door shut behind it, and the only way out to be at either side. Unlike most other orchids, the lady's-slipper has two perfect stamens, one on each side of the central, unfertile stamen. So, by whichever way the bee goes out, he is sure to brush against the pollen and carry some of it with him to the stigma of the next flower he visits. This pollen, unlike that of other orchids, is in grains, and is covered with a sticky coating which helps it adhere to the stigma to which it is carried.

The best-known species is the *stemless* lady's-slipper, a pink or white orchid found in the woods of Northeastern America and west to Indiana, Michigan, and Minnesota. This and other species are in danger of extermination because of thoughtless pickers of wild flowers.

LA FARGE, *la farzh,* JOHN (1835-1910). Famed for his outstandingly beautiful mural paintings and for his fine stained-glass windows, John La Farge was one of the most versatile artists America ever produced. Born in New York City, La Farge was sent to Paris at an early age to study art. In 1876 he began the murals for Trinity Church in Boston. He also created the mural decorations in the Minnesota State Capitol at Saint Paul. His windows in the Memorial Hall of Harvard University and those in Trinity Church, Buffalo, N. Y., are brilliant examples of his work in stained glass.

Among his paintings, *The Arrival of the Magi* is especially noteworthy.

AMERICA'S FRIEND IN NEED
The Marquis de Lafayette was America's staunchest friend during the Revolution. He trained troops, enlisted French aid, and spent much of his personal fortune to help pay for the war.

LAFAYETTE, MARIE JOSEPH PAUL YVES ROCH GILBERT DU MOTIER, Marquis de (1757-1834). The liberalism of Marquis de Lafayette, French military leader and statesman, made him sympathetic with the cause of the colonists in the American Revolution, and brought him to America in 1777 in a vessel which he had fitted out himself. He was made a major general by Congress and placed under Washington's command. The two became firm friends. Lafayette fought for American freedom with valor and courage and was wounded at the Battle of the Brandywine. In the defeat of Cornwallis at Yorktown, he was in command of the front ranks of the American troops.

Soon after the campaign, Lafayette returned to France, then torn by the first rumblings of the Revolution. He was called as a member of the Assembly of Notables and demanded that the king call the States-General, or national legislature, which had not been summoned since 1614. In 1789 Lafayette was elected a member of the States-General and was active in converting it into the National Assembly. He was made commander of the National Guards of Paris after the fall of the Bastille on July 14.

When the constitution of 1790 was finally adopted, Lafayette retired from public life to his estate at La Grange, but was soon called to service in the war with Austria and Prussia, being one of three major generals in command of the French forces. At this time, the Jacobins, the extreme Revolutionists, attempted to displace him from his powerful position, because Lafayette intended to use the army to restore a limited monarchy. Fleeing from the Jacobins, the general fell into the hands of the Austrians, who imprisoned him at Olmütz until 1797, when Napoleon secured his release. In 1818 he was elected to the Chamber of Deputies, where he advocated many liberal reforms.

Lafayette's visit to America in 1824 was a great personal triumph. As a token of gratitude, Congress granted him $200,000 and a township of land. The revolution of 1830 in France again saw him in active service at his old post as commander of the National Guards of Paris, and it was through his efforts that Louis Philippe came to the throne.

The Marquis de Lafayette was a man of Jeffersonian stamp. His whole life was closely bound up with the movement toward liberalism in the late eighteenth and nineteenth centuries. In 1789 he proposed a declaration of rights in the National Assembly which was very similar to the American Declaration of Independence. He firmly believed in the rights of man and democratic government. Although he approved of a monarchy, he wanted the king's power to be limited by a popular assembly.

LA FOLLETTE, *la fol' et,* ROBERT MARION (1855-1925). Politically a member of the Progressive group, Robert M. La Follette played an important part in the movement for reform legislation in the United States. Born in Primrose, Wis., and educated at the University of Wisconsin, La Follette began his career as district attorney for Dane County and entered the national House of Representatives in 1885. Defeated in 1890, he retired to private law practice in Madison, but in 1900 entered the political arena again and was elected governor of Wisconsin.

Although a brilliant record as governor brought him a second and a third term, he resigned in 1905 to become United States Senator, and he remained in the Senate until his death. In 1912, 1916, and 1924 he was an unsuccessful candidate for nomination as the Republican candidate for the Presidency. Upon his defeat in 1924 he headed the independent Progressive party. His sons, Robert, Jr., and Philip, have followed their father as political Progressives: the former in the United States Senate, and the latter as governor of Wisconsin.

LA FONTAINE, *lah fon tane',* JEAN DE (1621-1695). Characterized by liveliness, naturalness, and keen character studies, the stories and fables of Jean de La Fontaine, French poet, form an unusual and appealing part of the literature of France and have been imitated by many writers. In his fables La Fontaine pokes gentle fun at the fads and fashions of society in melodic and beautifully descriptive verse, but at the same time he points out many moral lessons and truths. The first volume of his *Tales* appeared in 1664, followed by a second in 1666 and a third in 1671. His six books of the *Fables* were begun about 1668.

La Fontaine spent much of his time in Paris, where he became acquainted with Molière, Boileau, and Racine, who were the center of a group of Paris wits. He was elected to the French Academy in 1683.

Above, courtesy Field Museum of Natural History

WHEN MAN USED LAKES FOR FORTS
Houses built on stilts in the water afforded the prehistoric lake dwellers protection against landbound marauders. Above, fishing.

LAISSEZ FAIRE, *lay say fair′*. This French phrase, freely translated, means *let people do as they please.* It is especially used by economists in referring to the relations between a government and the people. In the eighteenth century the popular idea was that "to govern better, it is necessary to govern less." In other words, the less the government interferes in the business and personal affairs of the people, the better off they are. Gradually, governments have been swinging to the opposite viewpoint. In the United States, government regulation of industry, interstate commerce, and many matters pertaining to public health and morals is an accepted fact. The doctrine of *laissez faire* has been sometimes identified with "rugged individualism."

LAKE. There is no definite dividing line between small lakes and large ponds. Bodies of water, properly lakes, are often called by other names, as are the *Dead Sea* in Palestine and *Green Pond* in New Jersey. Like swamps, lakes represent a lack of drainage of surface water, but their basins are deeper; that is, the water collects in a depression until it is high enough to find an outlet over its rim. Salt lakes usually occur in arid climates. The Great Lakes between Canada and the United States are the largest chain of lakes in the world, and their existence is probably due to a combination of causes, including a warping of the earth's surface, a hollowing of the beds by the glaciers, and an embankment of glacial debris around them.

Lakes are very important in the life of man. By acting as reservoirs they do much to prevent floods; they clarify the water and equalize the flow of streams that pass through them, improving the streams below them for navigation purposes; they afford a means of transportation; a source of fish supply; an outlet for sewage disposal; and furnish water and ice for cities.

LAKE DWELLINGS. To afford protection against animals or marauding tribes, many primitive peoples built their homes on piles in lakes or creeks. The most famous of such homes are the Swiss lake dwellings built by prehistoric man during the Stone and Iron ages. Remains of these homes were first discovered in 1853, and investigation revealed fruit and grain seeds, tools, and pottery, which tell us much about the lives of these ancient people.

Two types of lake dwellings have been found. In one, many piles were driven into the lake bed and on these the house was built; while in the other type, the house was built on a foundation of stone, brush, and mud held together by piles. This latter variety is called the *crannog* and is found chiefly in Scotland and Ireland. Refuse, broken implements, and household articles dropped in the water have left a fair record of these people.

Lake dwellings are common today among certain tribes in South America, Central Africa, and the Malay Peninsula.

LAKE OF THE WOODS. No prominent body of water was ever better named than the Lake of the Woods. Lying far north in Minnesota and forming part of the boundary between that state and Ontario, it is extremely irregular in shape. Its surface is dotted with beautiful wooded isles; its shores are a mass of dense timber. The lake has an area of approximately 1,500 square miles and drains a surrounding area of about 36,000 square miles. Although it is only seventy miles in length, its irregular shore line measures over 300 miles. It empties through the Winnipeg River into Lake Winnipeg. Extensive lumbering and gold mining are carried on in its vicinity.

LAMB, Charles (1775-1834). Some of the most delightful writing in the English language is to be found in the work of Charles Lamb. Remembered chiefly for his essays, Lamb also wrote poetry and several dramas.

Charles Lamb was born in London of a poor family and was educated at Christ's Hospital, a school for poor boys. At this school he and Samuel Taylor Coleridge formed a lifelong friendship. At the age of seventeen, Lamb secured employment as a clerk with the East India House, where he remained for over thirty years. In 1796 there occurred in his family a dreadful tragedy—his sister Mary, in a fit of madness, stabbed her mother to death. It was from that time on that Lamb displayed the courage for which he has since been remembered. Refusing to permit his sister to be confined to an asylum, he promised to care for her the rest of his life. And with loving kindness and cheerfulness he kept his promise.

One of the most familiar books in English literature, *Tales from Shakespeare,* appeared in 1807. It was written by Charles and Mary Lamb. In 1820 Lamb began to contribute to the *London Magazine* the essays for which he became famous. Later these essays were published in one volume as *Essays of Elia.* Humorous essays, they were written in a brisk, original style which has endeared them to his readers ever since. One of the best-known humorous essays ever written, *Dissertation on Roast Pig,* is included in this collection.

Among Lamb's other literary works are two dramas, *John Woodvil* and *Mr. H——*; a novel, *Tale of Rosamund Gray;* a collection of sixteenth-century dramas, *Specimens of English Dramatic Poets;* and *The Adventures of Ulysses.*

LAM'PREY. In both fresh water and salt water there may be found curious eel-like creatures, each with a queer mouthlike structure on the underside of the head, and a row of holes back of the eyes. They look somewhat like fish, but are not true fish. Instead of having jaws, the mouths of the lampreys are really sucking discs with teeth near the center. Lampreys live upon the bodies of fishes. In getting their food they merely attach themselves to a victim and with their teeth rasp a hole into the body and suck up the torn pieces. Lampreys that entered the Great Lakes by way of the Saint Lawrence Seaway became a serious threat to lake fish. Government agencies in Canada and the United States developed control measures that destroy the lamprey larvae near their hatching places.

Lampreys travel upstream to breed, swimming or attaching themselves to fish or boats going their way. At the chosen nesting place, the head of a riffle, they clear away stones by picking them up in their suckers. Eggs laid in the nest hatch into wormlike larvae which remain buried in the sand and mud for three or four years, then emerge as lampreys and go downstream.

In some parts of the world, lampreys are considered a table delicacy. They are eaten fresh or pickled in oil.

LAN'CASTER, House of. When Henry IV came to the throne of England in 1399, it marked the beginning of England's fourth dynasty, the House of Lancaster. Henry was crowned king following the enforced abdication of Richard II.

Though the title Earl of Lancaster originated in 1267, the name did not designate royalty until after John of Gaunt, fourth son of Edward III, married Blanche of Lancaster. Following the marriage, John was created Duke of Lancaster, and when his son Henry assumed the crown, he became the first of the Lancastrian Dynasty. The reign of Henry IV was followed by those of Henry V and Henry VI, the latter being deposed in 1461, during the Wars of the Roses between the Lancastrians and the Yorkists. Henry VI was restored to the throne in 1470, but was found dead in the Tower the following year, murdered, many believe, by order of Edward IV. Thus ended the reign of the House of Lancaster. See Roses, Wars of the.

LAND AND SEA BREEZES. In many lands, particularly in the tropics, off-shore and on-shore breezes are a daily occurence. These winds are land and sea breezes. They function because cool air always flows toward warmer areas. During the day the land becomes heated, the warm air expands and rises, and the cool breezes begin to blow in from the sea shortly before noon. At night the land becomes cooled and the waters of the sea remain warm; thus about midnight the breeze begins to blow from the land out to sea, continuing until sunrise.

Acme

A LAMPREY AND ITS PREY

Caught in the act, the long eel-like creature is shown attached to a large lake fish. Lampreys devastated fishing in the Great Lakes in recent years and posed a big problem for the fishing industry and conservation officers.

These winds are nearly always gentle and occur both in tropic and temperate regions that are not disturbed by local storms. Many of the cities along the Great Lakes are kept reasonably cool during the summer and moderately mild during the winter by the action of similar breezes to and from the water.

LAND CRAB. Closely resembling the ordinary crab is the land crab, which spends its early life in the water and retires to land as it matures. Although it seldom afterward enters the water except to lay its eggs, it continues to breathe through gills. It burrows into the damp earth where it makes its home. The land crab feeds at night on vegetable matter, seldom leaving its burrow in the daylight. It lives only in warm countries.

One species, the *black crab,* or *mountain crab,* of the West Indies makes its home in the hills often two or three miles from shore, visiting the water only in April or May. Some species are edible, and their eggs are considered a delicacy.

LANDS, PUBLIC. With the exception of a narrow strip of land along the Atlantic seaboard, site of the thirteen original colonies, all America has at one time or another been the *public domain,* or the *public lands.* The Federal Government, with slight variations from year to year, now owns about 400,000,000 acres of public land within the continental United States which are used for forests, grazing districts, national parks, military posts, Indian reservations, and government projects.

How They Originated. Previous to the signing of the Articles of Confederation, there were no public lands, except those claimed by each of the several states. These claims extended completely across the country in spite of the fact the French claimed the Mississippi Valley and the Spanish claimed the territory west of the Rockies. The states turned over their claims of western territory to the central government in 1781. To this beginning was added the Louisiana Territory, purchased from France in 1803. This great purchase of land, the largest ever made by the United States government, added over 1,000,000 square miles to the public domain and cost the government about $27,300,000, after interest payments had been met on the original price of $15,000,000.

The next addition was acquired by the purchase from Spain, in 1819, of East Florida and certain territory west of the Mississippi, an area of 72,000 square miles. At the request of the people living in Texas, that vast area was annexed in 1845, adding another 262,000 square miles to the public domain. The Oregon territory was claimed by discovery in 1792, and added 286,000 square miles; but it was 1846 before Great Britain accepted the claims of the United States. The close of the Mexican War in 1848 brought into the possession of the United States the territory from which the Southwestern states were created, an area of over 523,000 square miles. The Gadsden Purchase of 1853 brought an additional strip of land along the southern border of what are now New Mexico and Arizona. This land, totaling about 45,535 square miles, was bought from Mexico for the sum of $10,000,000. The last great purchase of public land came in 1867, when Alaska was purchased from Russia for $7,200,000. This purchase, considered sheer folly at that time, consisted of about 586,400 square miles and ultimately paid for itself many times over.

Settling the New Lands. A number of different methods of disposing of public lands have been used by the government. Gifts and grants of lands have been made to certain individuals for noteworthy services performed, similar donations have been made to several states to foster education and encourage the building of highways and railways, land subsidies have been given railroads to encourage their extension. Likewise, grants have been made to other corporations to encourage the development of resources.

Vast areas have also been sold to individuals who needed only to settle on the land and farm it for six months, and at the end of that period pay $1.25 per acre, receiving a clear title. This system was replaced by the famous Homestead Laws (see HOMESTEAD), under which settlers were required to live for five years on the land taken over for cultivation. Subsequent laws reduced the time to three years.

The Survey of Land. The surveying of public lands was begun in the Northwest Territory about 1790, and the same system prevails today. It provides for the division of lands under the rectangular system, whereby the land is divided into ranges, townships, sections, and quarter sections. Ranges extend north and south and are numbered east and west from the principal meridian. They are six miles wide and are divided into townships six miles square, which are in turn numbered north and south from a fixed parallel running east and west. Each township is divided into thirty-six sections one mile square, and the sections are further subdivided into quarter sections. These are so divided that it is possible to locate on the township map any

Colonial Williamsburg

A GARDEN BASED ON GEOMETRY

Formal gardens came to America from England. Englishmen brought the idea from China, where they had seen exquisite examples. Above, the gardens at Colonial Williamsburg.

area as small as five acres, with unerring accuracy.

Public Lands in Canada. Canadian public lands are classified as *granted* or *ungranted.* Ungranted lands lie in the older provinces and belong to them. They are parceled out by officials selected by the legislatures of these provinces. Ungranted lands in the Canadian Northwest Territories belong to the Dominion, and are under the supervision of the Department of the Interior at Ottawa.

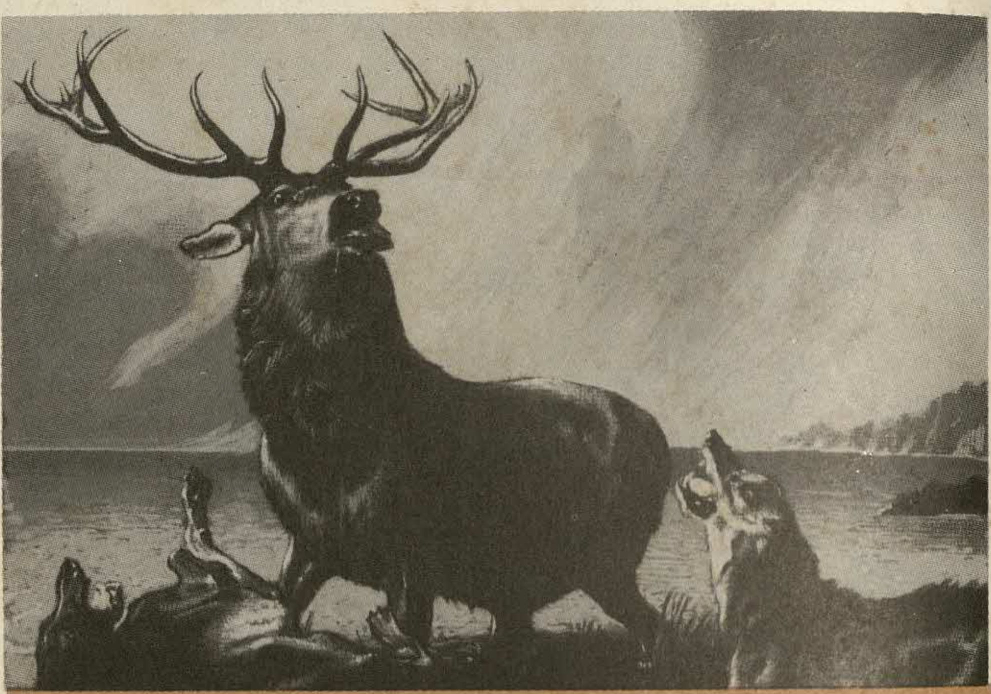
Any person in Canada, over eighteen years of age, who is a British subject, or who has declared his intention of becoming one, may settle upon a homestead of 160 acres. The only other requirement is the payment of a fee of $10 to the agent of the land office in the district in which he desires to settle.

LAND'SCAPE GARDENING. One of the newer arts is landscape gardening, the beautifying of parks and playgrounds and the grounds around homes, estates, and public buildings. It involves the planting and arrangement of trees, shrubbery, and flowers, and the laying out of paths and roads in such a way as to create a pleasing and effective whole.

General Principles. Variety and unity are the two most important principles of successful landscape gardening. Unity requires that the work be planned with one whole design, or motif, in mind and that all details contribute to that general plan. Variety requires the use of an assortment of growing materials to avoid an uninteresting sameness. Too great a variety should, however, be avoided.

Styles of Landscape Gardening. There are numerous styles of landscape gardening, but the two most important are the English, or *natural,* style and the Italian, or *formal,* style.

In the natural style the paths and plantings are informally arranged to present



MASTERPIECE OF ENGLAND'S GREATEST PAINTER OF ANIMALS
The Stag at Bay is one of the most celebrated of the paintings of Sir Edwin Landseer.

as natural an appearance as possible. Natural materials are used and are so grouped that the rustic spirit is maintained. All natural landscaping is based on a close imitation of nature.

The formal style is best carried out in small gardens or in grounds around formal buildings. It is characterized by straight lines and symmetrical balance. Formal designs are employed in setting out flower beds, and usually a formal garden is surrounded by a border of shrubbery, a wall, or a fence. Formal landscaping should be planned only on level, rectangular areas, where the main structural feature is used as the major axis.

LAND'SEER, Edwin Henry, Sir (1802-1873). The life of Sir Edwin Landseer, one of England's greatest painters of animals, is strikingly similar to that of France's Rosa Bonheur. Born in London of artistic parentage, he began his sketching of animals under his father's guidance when he was but five years of age. . When only fifteen he exhibited two pictures at the Royal Academy. At the age of twenty-three, he visited Sir Walter Scott at Abbotsford, Scotland. While there he completed a painting of Scott and his dogs, a work that started his rise to fame. He was a great sportsman, and learned to know the haunts of the deer, and to introduce them into his art. His most famous efforts were portrayals of the dog and his almost human relation to man.

Made a member of the Royal Academy in 1831, Landseer was knighted in 1850 and later received gold medals at the Paris and Vienna expositions. Famous among his works are *Dignity and Impudence, A Distinguished Member of the Humane Society, The Stag at Bay, Cat's Paw, A Piper and a Pair of Nutcrackers,* and *The Old Shepherd's Chief Mourner.* Landseer's portraits were also noteworthy, the best being those of himself and his father. Much of Landseer's fame resulted from his brother's fine engravings of his works.

LAND'S END. To the "land-hungry" seafarer approaching England from the west, Land's End is a welcome sight indeed. This jutting cape of granite cliffs, from 60 to 100 feet high, has been sculptured into strange shapes by the action of the sea. Lying in Cornwall, at the entrance to the English Channel, it is the westernmost point in England. A mile to the west, on the dangerous Longships rocks, a lighthouse stands guard.

LANG'LAND, William (about 1332-about 1400). One of the most eminent English poets of his day, William Langland lived and wrote during the time of Chaucer. His most important work was an allegorical and satirical poem, *The Vision of Piers Plowman,* attacking abuses in the Church and government.

LANG'LEY, Samuel Pierpont (1834-1906). Had it not been for an accident when he attempted to launch his flying machine, Samuel Pierpont Langley might today be remembered as the inventor of the airplane. For this American scientist had built many airplane models that flew, and had constructed a large plane capable of flight. Then, in 1903, just a few days before the Wright brothers made their immortal flight at Kitty Hawk, N. C., he attempted to launch his plane; an accident occurred, and the honor of being the first to fly went to the brothers from Dayton, Ohio.

Born at Roxbury, Mass., Langley was educated in Boston and Europe, later becoming an assistant at the Harvard Observatory. He next became professor of mathematics at the United States Naval Academy and was appointed secretary of the Smithsonian Institution in 1887. In addition to his experiments with flight, Langley also conducted studies of the sun, inventing a delicate instrument for measuring heat, the bolometer. See Airplane; Flying, Story of.

LANGUAGE, *lang' gwij,* **AND GRAMMAR.** Specifically, grammar is the science of the correct use of language to express thought. Its study results in proper speech, the ability to write effectively, and the building up of a good vocabulary. It is important to the lawyer, the scientist, the teacher, and, in fact, to everyone who wishes to say what he means and to understand exactly what others mean.

The first training in grammar was based on the old Latin method of "weary, dreary parsing," entirely unrelated to one's daily needs. The teaching of grammar in modern schools is linked closely with other lessons; thus there are always opportunities to *hear, read,* and *practice* good English. There are certain rules which must be thoroughly understood. These are learned, however, not alone by memorizing, but also by constant practice.

The Parts of Speech. These include the noun, pronoun, verb, adjective, adverb, preposition, conjunction, and interjection.

Every noun and pronoun has gender (denoting sex), number (denoting one or more than one), and case (denoting use in the sentence). Furthermore, nouns and pronouns may be either common (as *rock*), or proper (as *Tom*).

Verbs show action or state of being, and in addition to having number, have also person (showing the speaker, the one spoken to, or the one spoken of); mood (showing whether the action or state is actual or merely probable); tense (indicating time), and voice (showing whether the subject is acting or being acted upon).

Adjectives are used to describe a noun or pronoun. They may be changed in form, or *inflected,* to show the degree of the quality they represent, as *pretty, prettier, prettiest.*

Adverbs are words modifying verbs, adjectives, and other adverbs. Many of them may be inflected to show degree, as *fast, faster, fastest.*

Prepositions are words showing the relation between a noun or pronoun and some other word in a sentence. In the sentence, "The boy ran into the house," the word *into* is the preposition, showing the relation between the verb *ran* and the noun *house.*

Conjunctions are words joining words,

phrases, or clauses together in a sentence. Such words as *and* and *or* are common conjunctions, usually called *co-ordinating*. Another type, the subordinating conjunction, is used in complex sentences; for example, "He wanted to go, *although* he knew there was danger." Here the conjunction *although* joins the subordinate clause to the principal clause.

The interjection has no relation to the rest of the sentence and is merely an exclamation. It is followed by an exclamation mark. A typical example of the interjection is "Oh!"

How Sentences Are Built. Every sentence must consist of a subject and predicate. The most important word in the subject is usually a noun or pronoun which performs, or upon which is performed, the action; or of which something is asserted. The most important word in the predicate is the verb, which asserts or shows the action or state. Other words in the sentence are added to express the thought of the speaker or writer more completely.

There are three types of sentences: *simple, compound,* and *complex.* The simple sentence has but one subject and one predicate, expressing one complete thought, as "I saw a cat." The compound sentence expresses two or more complete ideas of equal importance; that is, there are two independent clauses, each having its own subject and predicate. "Birds sing and dogs bark" is a compound sentence. The complex sentence is also composed of two or more clauses; but there must be at least one principal clause and one subordinate clause modifying some word in the main clause. "Because I was ill, I could not go" is a complex sentence.

Common Errors in Speech and Writing. Grammatical errors are called *solecisms.* There are numerous kinds of errors, of course, but the ones discussed below represent the principal violations of grammatical rules.

Errors occur when modifiers are misplaced. Modifiers should, as a rule, be placed as near as possible to the words they qualify. Otherwise a ridiculous statement may result. In the sentence "They erected a monument in honor of the battle, which was made of granite," the clause beginning with *which* is obviously misplaced. The sentence should read, "In honor of the battle they erected a monument which was made of granite."

Sometimes incorrect, confusing, or obscure references are made. Such references should be carefully avoided. Remember, for example, that a word referring back to another word must agree in number with that word. Do not say, "Everyone said that they would help." *Everyone* is singular, but *they* is plural. The sentence should read, "Everyone said that he would help." In the sentence "She told her that her mother needed her," the reference is confusing. We do not know whose mother needed whom. In the sentence "A ship was dashed to pieces on the rocky coast, and this caused loss of life," the reference for the word *this* is obscure.

Errors occur when dissimilar parts of a sentence are connected by co-ordinate conjunctions, such as *and, for, but.* Co-ordinate conjunctions are properly used to connect equal and similar parts of the sentence. Do not say, "I went there yesterday but walking." The words *went* and *walking* are not similar. It is also desirable sometimes to *subordinate,* or reduce the emphasis of, one part of a sentence to give an exact meaning or to avoid confusion. Thus the sentence "He was ill; so he consulted a doctor" is improved by changing it to "Because he was ill, he consulted a doctor."

Another type of error occurs because of a careless use of *ellipsis,* the omission of words which one is supposed to understand from the context of the sentence. In the sentence "Fred likes John more than Charles," the meaning is obscure. We do not know whether Fred likes John more than he likes Charles or whether Fred likes John more than Charles likes John.

Always keep in mind the rule that a verb must agree with its subject in person and number. This rule holds no matter how many words are placed between the subject and the verb. We say "Mary walks to school," and we also say, "Mary, like Joan and Mabel, walks to school."

Consult the following titles for additional information:

- Adjective
- Adverb
- Article
- Conjunction
- Grammar
- Noun
- Participle
- Preposition
- Pronoun
- Verb

LANGUAGES OF THE WORLD.

When we think of the things we can do because we have a language, we realize what a great debt we owe to that inventive genius of man which enabled him to devise the words forming the languages of the world, both written and spoken.

What is Language? In simplest terms, a language is a device by which people speak to one another. In order to do this, each of the sounds made must have a definite meaning to all members of the group. The basic principle is the same for any tongue: language is made up of vocal sounds which come to mean a certain thing to all people using the tongue.

At first man made sounds to express his emotional feelings, such as fear, joy, or love. He also learned that if he made a certain sound (as the growl of a bear), this sound would stand for bear in the minds of other men. Of course, no one actually knows how language originated, but it is generally agreed that the first language was probably composed of such animal-like sounds and imitations of sound in nature. The sounds gradually developed into a spoken language.

Need for Language. When man had developed a number of sounds, he could use them to tell others of his experiences and knowledge. The existence of a language enabled each new generation to know what the previous generation had learned, without having to discover everything all over again. In this way society progresses, building up new thoughts and ideas on the superstructure of the old, rather than starting at the ground level each time. This kind of progress comprises education. With the aid of a language, society is given a stability which would be absent if men were unable to talk to one another. Language also has the advantage of being efficient and easily used; with it one can express abstract ideas which cannot be easily communicated by signs or pictures.

The Language Families. At first glance there seems to be little relationship between the more than 6,000 languages and dialects of the world. But the scientific study of languages, called *philology* or *linguistics,* shows the opposite to be true. Linguistics is devoted not to the study of just one language, but rather to the study of all languages. When philologists began to study languages, they noticed that many of them showed similarities in structure and could be grouped together. These groups are called *linguistic families.*

Philologists also believed that the languages in such groups all descended from one tongue spoken by one tribe which lived long ago. As the members of the tribe speaking this tongue drifted apart, they introduced the variations in their language which resulted in the different tongues today. Despite these differences, the basic structure of the original language was retained; and thus we know that these languages all came from a common tongue.

The leading linguistic families are the Indo-European, or Aryan; the Hamito-Semitic; the Indo-Chinese; the Finno-Ugric, and the Turkish and Mongolian groups. The modern languages of the Indo-European group are charted below, these two dozen tongues comprising the most important languages of the world. The Hamito-Semitic group includes Hebrew, Babylonian, Syriac, Arabic, Egyptian, and various related tongues. The Indo-Chinese family includes Chinese and Siamese, and the Finno-Ugric group includes Finnish, Estonian, Karelian, and Magyar.

There are also several smaller linguistic families, such as the American Indian groups. Certain languages do not as yet appear to be members of any group. Among these are Japanese and Basque, the latter spoken in Southern France and

Northern Spain. Every language has numerous dialects; but these are regarded as variations of one language, and not as independent tongues.

Modern Aryan Tongues. The table below gives the various subfamilies and languages of the modern Aryan linguistic group:

SUBFAMILIES	LANGUAGE	NUMBER USING
Indo-Iranian	Hindustani (N. India)	216,000,000
	Persian	15,000,000
Armenian	Armenian	
Greek	Greek	6,940,000
Italic	French	68,900,000
	Spanish	102,700,000
	Italian	43,700,000
	Portuguese	48,800,000
	Flemish	3,500,000
Celtic	Irish	
	Welsh	
Germanic	Swedish	6,266,000
	Norwegian	2,814,000
	Danish	3,707,000
	German	78,947,000
	Dutch	16,548,000
	English	270,000,000
Baltic	Lettish	1,905,000
	Lithuanian	2,393,000
Slavonic	Russian	166,000,000
	Bulgarian	6,078.000
	Polish	32,000,000
	Czech	7,500,000
	Serbo-Croat	11,000,000

How Languages Grow. The basic language develops and grows in several ways. Man borrows words from other languages as a result of wars, invasions, or trade. Thus, the language is enriched with many new words and continues to grow. In the course of time, changes are also made in the spelling, meaning, and pronunciation of words, and the language develops further. New expressions are continually being coined for a language. Many of these are slang at first, but eventually come to be accepted members of the language. The machine age brought many new terms into common use, and war and sports are responsible for many others. Our modern English is a far cry from the English of Chaucer; however, the development of the language will not stop with us, but will continue just as it has during the past.

For further information consult the following articles:

- Alphabet
- Consonant
- Dialect
- English Language
- Esperanto
- Etymology
- French Language
- German Language
- Greek Language
- Hebrew Language and Literature
- Hieroglyphics
- Italian Language
- Latin Language
- Romance Languages
- Rosetta Stone
- Runes
- Semitic Languages
- Sanskrit Language and Literature
- Sign Language
- Syriac
- Vowel
- Writing

LANSING, MICH. This city of 109,000 is situated at the junction of the Grand and Cedar rivers ninety miles northwest of Detroit. It has been the capital of the state of Michigan since 1847. The impressive, domed capitol stands in the center of the city in a twelve-acre park. Other notable buildings in Lansing are the state office building, Federal building, and city hall.

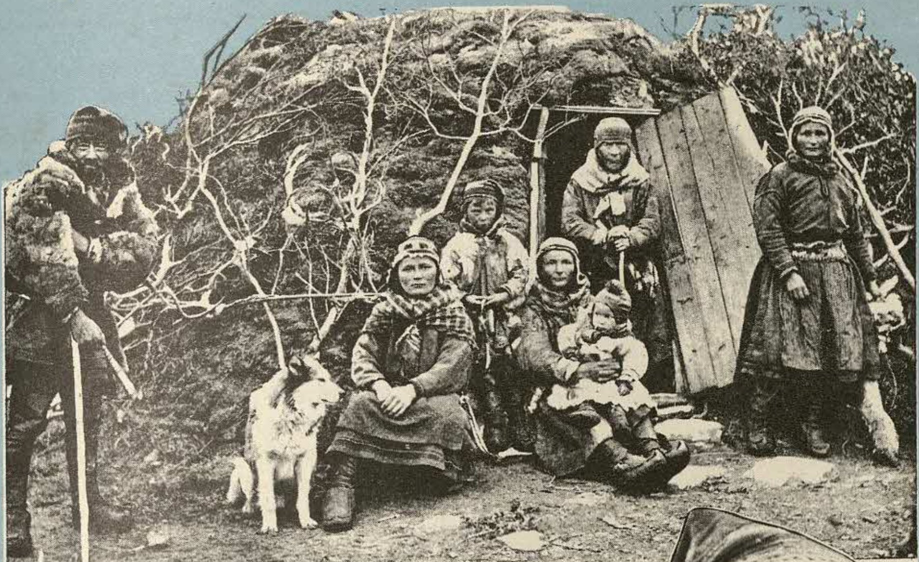
Lansing's manufactures include automobiles, stoves, diesel engines, cut glass, and condensed milk. At adjoining East Lansing is Michigan State University.

LAOCOÖN, *la ok' o on.* See TROY.

LAOS, *lous,* is an independent kingdom, located on the Indo-Chinese peninsula in Asia. It is bounded by Cambodia, Thailand, China, North Vietnam, and South Vietnam. It was a part of old French Indo-China. It became completely independent in 1954. Its area is about 89,000 square miles, and its population is about 3,000,000. Its capital is Vientiane. The Mekong River on its western border is Laos's outlet to the sea. The king appoints the Prime Minister. The National Assembly is the legislative body. For history, see FRENCH INDO-CHINA.

LAPIS, *lap' is,* **LAZ'ULI** is a blue mineral which has been used since ancient times for jewelry settings and inlay work. There are azure, violet, green, and ultramarine tints. It is mined in Mexico, Chile, Siberia, India, and Iran. Lapis lazuli formerly was used as an artist's pigment. It is featured today in mosaics, vases, and small ornaments.

LAP'LAND. Politically, there is no such country as Lapland. Rather, it is the far-northern, poorly defined area inhabited by the Lapps, extending across Northern Norway, Sweden, Finland, and the Kola Peninsula in Russia. This vast area of some 150,000 square miles, lying in the extreme northern part of the Scandinavian

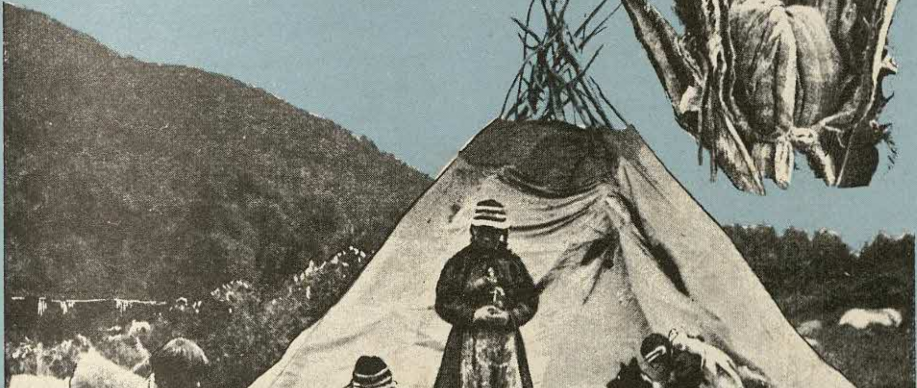


(2) Courtesy Norwegian-American Line (3) Ewing-Galloway

2

INTERNATIONAL NORTHERNERS

Lapland is an Arctic region stretching across the north of Norway, Sweden, and Finland and the Kola Peninsula of Russia. So chilly is the home of the Lapps that they have had to domesticate reindeer instead of using less hardy animals. Lapps themselves are seldom able to go without furs. (1) A family of Lapps in upper Norway. All occupy the little earthen "house." (2) A weather-beaten Lapp farmer. (3) A Lapland camp whose tent is strikingly like an American Indian wigwam.



Peninsula, touches the Atlantic and Arctic oceans on the north and roughly follows the sixty-fifth parallel on the south.

The Lapps, numbering about 30,000, are short and muscular and are characterized by their large heads, scanty beards, high cheek bones, and flat noses. Although ignorant and untidy, they are generous and hospitable. Few towns are found here, most of the Lapps living a nomadic life or in scattered settlements. They rely on the reindeer for food, clothing, and transportation. Life in Lapland is rigorous because of the months of bitter cold weather, when the sun is never seen. The progressive River Lapps live in rude villages; the Sea Lapps, along the ocean, rely entirely upon fishing, and the Mountain Lapps follow their herds of reindeer from the lowlands to the uplands with the changing seasons.

STURDY RELATIVE OF THE PINE
The larch makes durable telegraph poles.

LARCH. A tree common to the north temperate regions is the larch. Like the pines and the spruces, it bears cones; but, unlike them, it sheds its needles in the winter, since it is a deciduous tree.

The ten or so species of the larch thrive particularly in the cooler, moister districts of Asia, North America, and Europe. When at their best, the trees are tall and beautiful, with straight trunks and horizontal branches. The bark peels off in flakes or may be furrowed. The trees are easily recognized by the short spurs on the twigs, which are thickly beset with short needles in the summer or with leaf scars in winter. The small cones of larches remain on after the leaves are shed, and help us to recognize the trees at a distance.

Three species of the larch are native to North America: the American larch, called *tamarack* in the Middle and Western United States and *hackmatack* in Canada; the *western larch;* and the *alpine larch.*

Because it is strong and tough, the larch is used in shipbuilding and for railroad ties, telegraph poles, fence poles, and river piles.

LARD. Packers make lard by melting and refining the fat of hogs. The best grade comes from the layers of fat surrounding the kidneys. A second grade comes from the backs and sides and the trimmings from various cuts.

The fats used in cooking are composed chiefly of three fats known to the chemist as *olein, palmitin,* and *stearin.* These fats have different melting points, olein having the lowest and stearin having the highest. If a fat has a large proportion of stearin in it, as beef suet has, it will be harder than when it has more palmitin or olein. Lard has a larger proportion of olein (containing sixty-two per cent) than stearin and palmitin, and hence is softer than beef suet and mutton tallow.

Lard is used in cookery, in soap manufacture, and in ointments.

LARK. Praised in the works of poets is the lark, a famous songbird of Europe, Asia, and Africa. It is related to the finches and makes its home on the ground, living on worms, insects, and seeds. There are more than a hundred species of the larks.

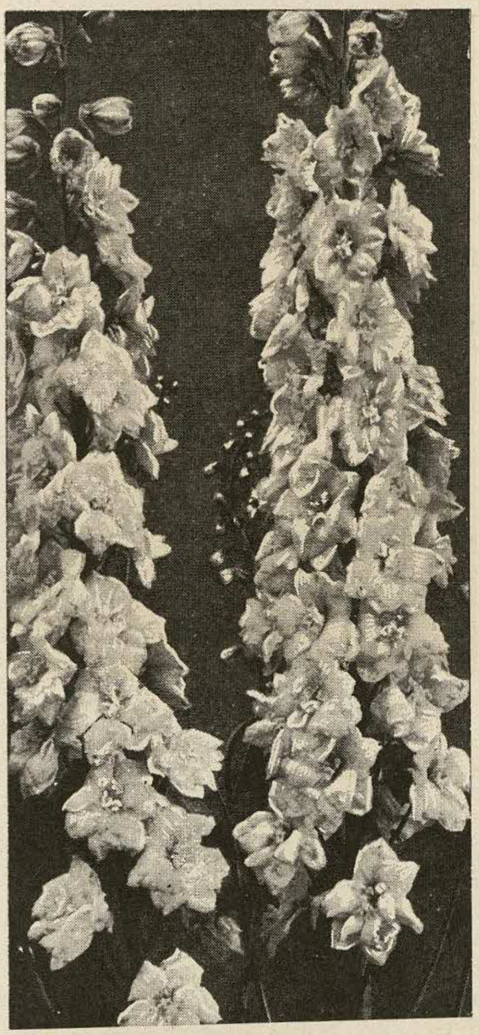
The best known of the larks is the *English skylark*, beloved for the beautiful song it sings as it soars high into the air and out of sight. It is still singing when it appears again and returns to its nest on the ground. It sings in the early morning, usually only during the nesting season. Skylarks have been imported into the United States, and a few are now found on Long Island and elsewhere in the East.

The native American species of lark is the *horned* lark. It is white under the throat and is marked with black about the eyes and top of the head. Above each eye is a tuft of feathers which can be raised to resemble tiny horns. Most larks are speckled brownish above and brown and white below. They build their nests in open fields and lay from three to five speckled eggs. Two broods are hatched each year.

The *titlark* and *meadowlark* of America are not true larks. The titlark is a pipit, and the meadowlark is related to the oriole.

LARK'SPUR. Often cultivated as a garden flower, the larkspur, a member of the crowfoot family, gets its name from the peculiar long spur that grows on each blossom. The larkspur belongs to the genus *Delphinium,* the Latin for *dolphin.* This name was applied because the buds resemble that sea animal in shape.

In gardening, the annuals are considered larkspurs and the perennials delphiniums. The annuals vary from one and one-half to two feet in height, may be single or double, and are white, pink, light or dark blue in color. The perennials are even more popular, with long spikes of purple, violet, light-blue, or dark-blue flowers. They are often used as the back line of a flower border, for they sometimes grow to a height of six feet.



DECORATIVE LARKSPUR SPIKES

LARVA, *lahr'vuh.* The young of any insect which has a distinct resting stage before it becomes an adult is a *larva.* It is greatly different in appearance from the adult, and only knowledge gained by observation or study can tell us into what insect it may be transformed. It is distinguished from a *nymph* (the young stage where there is no resting period) in appearance in only one constant feature. The nymph always has compound eyes similar to those of the adult, while the larva never has compound eyes and is often entirely eyeless.

Some of the common forms of larvae are: the *maggots* of flies; the *wrigglers,* which change to mosquitoes; the *caterpillars,* which change to butterflies and moths; and the *grubs,* which change to various beetles. See INSECTS.

THE FATHER OF WATERS FOR FRANCE

The French explorer La Salle sailed down the Mississippi to its mouth; claimed the entire valley for France. He named the region Louisiana, in honor of his king, Louis XIV, but lack of colonists doomed French influence in America, and the United States bought Louisiana.

LARYNX, *lar′inks.* Without the larynx, man would have no voice. It is an irregular boxlike structure located below the *hyoid bone* and having communication with the *pharynx* above and the *trachea,* or *windpipe,* below. Built almost entirely of cartilage, the larynx is composed of nine variously named and shaped pieces connected with ligaments and muscles and lined with a mucous membrane that continues through the thrachea and pharynx.

The most prominent of these cartilages is the *thyroid,* which forms an angle in front (the Adam's apple), but is not joined at the back to form a complete ring. To the top of the thyroid is attached the *epiglottis,* which closes the opening between the pharynx and the larynx when one swallows.

The *vocal cords,* fibrous bands of membrane, stretch across the larynx between the thyroid and the *arytenoid* cartilages. A slit between the vocal cords, known as the *glottis,* is open in quiet breathing. The arytenoid cartilages are operated by four sets of muscles, which serve to stretch, loosen, bring together, or separate the vocal cords, producing different tones. The tighter and closer together these cords are forced, the higher will be the voice, just as when the strings of a violin are stretched. Directly above the vocal cords is a triangular-shaped space, lined with membrane and containing folds on either side known as the *false* vocal cords.

LA SALLE, René-Robert Cavelier, Sieur de (1643-1687). The first Frenchman to descend the Mississippi to its mouth, La Salle is honored for the part he played in the development of New France. He went to Canada from France in 1666 and established a trading post near Montreal, expecting to become a fur trader. A desire to explore the uncharted country to the west made him abandon his venture, and in 1669 he started off with a band of missionaries, bound for the Great Lakes country. La Salle and a small group soon separated from the others, and on this expedition he explored the Illinois River Valley.

Later, in 1680, he established Fort Crèvecoeur, the first white settlement in Illinois, and in 1682 led a party down the Mississippi to its mouth. The great Mississippi Valley he named Louisiana, in honor of Louis XIV. In 1684, having returned to France to collect men and supplies for a colony, La Salle attempted to reach the mouth of the Mississippi by way of the Gulf of Mexico. A mistake was made in the place of landing, and the colonizing scheme met with failure. In 1687 La Salle started north with a small group, and was shot by one of his men from ambush.

LA'TERAN. This name is applied to a group of religious buildings located in the southwestern part of Rome. The Lateran group is composed of the Pope's church, the Lateran Palace, and several smaller buildings. The church, now known as the *Basilica of the Saviour,* is the cathedral of the Popes. The site of the group was seized by Nero from Plautius Lateranus, its original owner, and was returned to the Catholic Church by Constantine the Great. The buildings and grounds become the property of each of the Popes, as soon as he is elected. The palace, which was formerly the residence of the Popes, is used to house the Pontifical Museum of Christian Antiquities. In the church have been held the famous Lateran councils.

LATIN LANGUAGE. Root of the Romance languages — Italian, Spanish, French, Portuguese, and Rumanian—Latin is the mother of a great body of our English words and for 2,000 years has been the international language of learning, law, and Church.

What we call the classical language was the Latin of Rome at its zenith. As early as 1500 B. C., Latin was the spoken tongue of Central Italy, but it had attained its purest literary form at the time of the republic and the empire. Then, as the Romans conquered their world and gave their language to the Mediterranean countries they invaded, it became corrupted. By the eighth century after Christ, Latin was no longer the common spoken language, and was diverging into Spanish and French and other forms. These Romance languages really are not direct descendants of the literary Latin taught in our schools, but are indirectly descended from the folk Latin that developed as Rome declined.

Latin influence on our vocabulary is easily recognized by the student of Latin. While some Latin was brought to England at the time of Caesar's invasion of the isle, it was almost negligible, for the Roman power in England was short-lived and the German tongues had a very strong influence on English. Most of the words of Latin origin that we use today came to England with the Norman conquest.

It was the monks and clergy of the early Church who kept Latin alive through the Dark Ages, preserving Latin literature in their monasteries and libraries; and so Latin is the official language of the Roman Catholic Church today. Because of its mechanical structure and accuracy of expression, Latin has performed a lasting service in law and medicine and in higher learning.

Latin is a member of the Indo-European or Aryan group of languages, and is closely related in words and structure to Greek. In the United States the schools and colleges usually teach Latin pronunciation as it was in the time of Cicero. The vowels are given the broad sound as in Italian, while the consonants are as in English except that *c* and *g* are always hard, *z* is like *dz,* and dipthongs *ph, th,* and *ch* are aspirated consonants, *r* is trilled, and *s* voiceless. In England, however, Latin is pronounced under the rules of English. For example, in America, *regina,* the Latin word for *queen,* is pronounced *ra ge'nah,* the *g* hard as in *good;* while in England it is pronounced *re ji' nah.*

LAT'ITUDE. Encircling the earth from east to west are imaginary lines which determine distance north and south of the equator. These lines are parallels of lati-

Courtesy C. S. Hammond and Co.

NAVIGATORS' GUIDE LINES CIRCLE THE GLOBE

Latitude, or position north or south of the equator, is marked off in numbered parallels.

tude, those north of the equator being called *north* latitude, and those south of the line *south* latitude. Using the equator as 0, the parallels are measured in degrees, up to 90, the North Pole being 90° north latitude, and the South Pole 90° south latitude. By computing the altitude of the Pole Star, or North Star, above the horizon, one may determine his own latitude.

For additional information, consult:

Antarctic Circle
Arctic Circle
Equator
Longitude
Longitude and Time Zone

LATTER-DAY SAINTS, Reorganized Church of Jesus Christ of. The Church bearing this title claims to be the true successor of the religious sect established by Joseph Smith, the founder of the Mormon belief. Its leader is Frederick M. Smith, grandson of Joseph Smith, and headquarters are at Independence, Mo. There are about 131,000 members and about 650 church buildings. There is no connection between the Reorganized Church and the Mormon Church. See Mormons; Smith, Joseph.

OLD WORLD LAND OF CHARM

Latvia was for many years part of czarist Russia, and enjoyed brief independence before the period of Soviet domination. Its people retain a fierce spirit of independence, and cling to many of the customs handed down by their ancestors.

LATVIA. The former Russian province of Courland and parts of Livonia and Vitebsk comprise the Latvian Soviet Socialist Republic. The country is bounded on the north by Estonia, on the east by Russia, and on the south by Lithuania and Poland. The Baltic Sea stretches along the western border, and all of Latvia's ports have excellent harbors. Many of the imports and exports of central Russia pass through these ports. Riga, the chief seaport, with a population of about 393,000, is the capital. Latvia contains about 25,000 square miles and has a population of over 2,000,000. The inhabitants of the land are chiefly Letts, though there is a plentiful sprinkling of Russians and Germans.

Agriculture is still the leading occupation although the industrial development of the country is rapidly becoming more and more important. Potatoes, flax, rye, barley, oats, and wheat are the leading crops. Peat and gypsum deposits are plentiful in all Latvia. Hydroelectric plants have been established on the many lakes and rivers and lumber from the dense forest lands is moved to the seacoast through this intricate network of waterways.

Latvia has been ruled by many foreign peoples. It broke away from Czarist Russia in 1918, as did the other Baltic provinces, and became a republic. The Free State of Latvia maintained its independence for twenty-two years. During this period the great estates were divided among the farmers; more schools were provided, and a democratic government was established. In 1940 Latvia became a Soviet Socialist Republic. It was conquered by Germany in 1941, but in 1944 was retaken by Russia. Most countries, including the United States, have refused to recognize the Soviet annexation of Latvia. Latvia still retains many old customs. See UNION OF SOVIET SOCIALIST REPUBLICS; WORLD WAR II.

LAU'REATE. See Poet Laureate.

LAU'REL. In ancient Greece, laurel wreaths were bestowed upon the outstanding scholars and winning athletes in the Olympics. A few hundred years later, the Romans crowned the heads of their victorious military leaders with laurel as a symbol of public esteem.

A native plant of North Africa and Southern Europe, the laurel is now grown commonly in flower gardens, not only for its beauty, but for its fragrant evergreen leaves as well. The *mountain* laurel is a shrub bearing glossy dark-green leaves and magnificent pink flowers which bloom in June. The flowers grow in great clusters, sometimes four or five inches across.

Laurel flourishes in the Allegheny Mountains and in the Sierra Nevadas in the West. It is poisonous to stock, heavy losses of sheep having been reported because of flocks eating the *black* laurel and *white* laurel.

LAURENTIAN, *law ren'shi an,* **HIGHLANDS.** Circled about the Hudson Bay, in Canada, and embracing an area of more than 1,800,000 square miles, is a vast watershed often referred to as the Laurentian Highlands. It stretches from Labrador almost to the Mackenzie River and covers nearly half the Dominion. The general altitude of the plateau varies between 1,000 and 2,000 feet.

The rocky region is of little value for agriculture, being a maze of lakes and dense forests. The rivers of the northern slope drain into Hudson Bay; those of the southern slope, into the Atlantic and the Saint Lawrence; and those of the northwest into the Arctic Ocean. In the Saint Lawrence Valley, considerable fertile farm land is found.

LAURIER, *lo'ri ay,* Wilfrid, Sir (1841-1919). The first Premier of Canada to rise to that position from the nation's great French population was Sir Wilfrid Laurier, whose fifteen-year administration was an era of vast internal growth and important development of Canada as a great individual nation in the British family.

Sir Wilfrid was born at Saint Lin, in the province of Quebec, and was educated at L'Assomption College and at McGill University in Montreal. His first public service was as a member of the provincial assembly of Quebec; three years later he was a member of the Dominion House of Commons. When the liberal Alexander Mackenzie became Premier in 1877, Laurier was appointed Minister of Inland Revenue. This post he held only one year, until he was forced to resign when the Mackenzie government was defeated in 1878. Laurier then became active in the Liberal opposition group, rising, in ten years, to the acknowledged leadership of the faction. When the Liberals returned to power in 1896, Laurier was called upon to form a Cabinet. He was knighted by Queen Victoria in the following year.

The Laurier administration, while remaining absolutely loyal to the Mother Country, was especially distinguished for its work of strengthening the Dominion itself. Thus, while troops were dispatched to Britain's Boer War in Africa, special tariffs were enacted against goods imported from Great Britain, lest Canadian industry suffer unjust competition. The extension of Canada's frontier and the development of new, untouched resources proceeded rapidly in the period. A new transcontinental railway was built, and Alberta and Saskatchewan were formed.

In 1910, Laurier worked out a trade treaty with the United States which proved his undoing, since Canadians did not approve. He resigned in October, 1911, again to take up the cause of Liberal opposition. During the First World War he advocated Canadian participation but denounced the draft. Throughout his public career, Sir Wilfrid displayed great skill in statesmanship and government, and his expert oratory on behalf of a Liberal government was often enormously effective. Today he is ranked among Canada's greatest sons.

LAVA, *lah'vuh.* Large areas on the island of Hawaii are covered with bare rocks, some of a curious, ropy appearance, and others that resemble a jumbled mass of jagged blocks. These rocks were spread out in this fashion while still hot and fluid, and both before and after cooling are classed as lava. Lava issues from the interior of the earth through volcanoes, and through great cracks or fissures in the surface of the earth. In the former case a roughly circular structure will be built up around the opening (see VOLCANO); and in the latter, especially if the lava is thin and very fluid, it will be spread out to cover large areas.

In Oregon, Idaho, and Washington, a mountainous area of about 150,000 to 200,000 square miles was buried beneath a covering of lava in places 3,000 feet thick. In India, on the plateau of Deccan, a similar flow of lava, poured out in a fissure eruption, buried the land to a depth, in places, of 6,000 feet.

When weathered, these lava soils are usually rich in plant food and very productive, if well watered. However, it requires many thousands of years for the lava to weather enough to become valuable soil. See IGNEOUS ROCKS.

LAV'ENDER. Famed for its use in perfume, the lavender is a flowering plant belonging to the mint family. It is a native of Southern Europe and is extensively cultivated in England and France. It gets its name from the Latin *lavo,* meaning *to wash;* ancient Romans used the flowers and leaves of the plant to perfume their baths. In America the lavender is popular as a garden flower, particularly in California.

The shrub grows to a height of three or four feet, bearing small violet-blue flowers which hold their fragrance for a long time after drying. From these flowers is pressed

REAL BRIMSTONE
Lava is molten rock, just plain stone so hot it is liquid. Terrific heat and pressure within the earth force the molten rock to the surface in volcanoes, some of which boil continuously Others erupt violently and cause great destruction. Here is a lava field of Paricutin volcano, Mexico, and the same volcano in action.

an aromatic yellow oil, very pungent in taste. It is used as a medicine and as the base of lavender water and Florida water, popular toilet waters.

LAVOISIER, *la vwah zya',* ANTOINE LAURENT (1743-1794). Called the founder of modern chemistry, Antoine Laurent Lavoisier, famous French chemist and physicist, conducted some of his most important experiments in connection with the composition and nature of air. He discovered the function of oxygen in burning and thus made known the true nature of fire. It was he who originated the term *oxygen.* His investigations of chemical reactions led to the discovery that the weight of the end products is exactly equal to that of the reacting substances. From this discovery came the law of conservation of matter. Lavoisier is also credited with the modern classification of substances into elements and compounds and with many of the chemical terms used today.

Lavoisier did not devote his entire time to the sciences. He served in various public offices and labored to improve social and economic conditions in France. Among his many suggestions were those recommending improvement in housing, the adoption of scientific agriculture, and the establishment of new taxation, banking, and monetary systems. Because he was one of the officers charged with the collection of taxes, Lavoisier was guillotined during the Reign of Terror.

LAW. As universally defined, law is a rule of action. Blackstone, a famous eighteenth-century legal writer, in his *Commentaries* says, "Law is a rule of civil conduct prescribed by the supreme power in a state commanding what is right and prohibiting what is wrong." It therefore may be said to embrace all legal and equitable rules defining human rights and duties and providing for their enforcement, not only as between man and man, but between the state and its citizens, and, in the broadest possible application, between one nation and another.

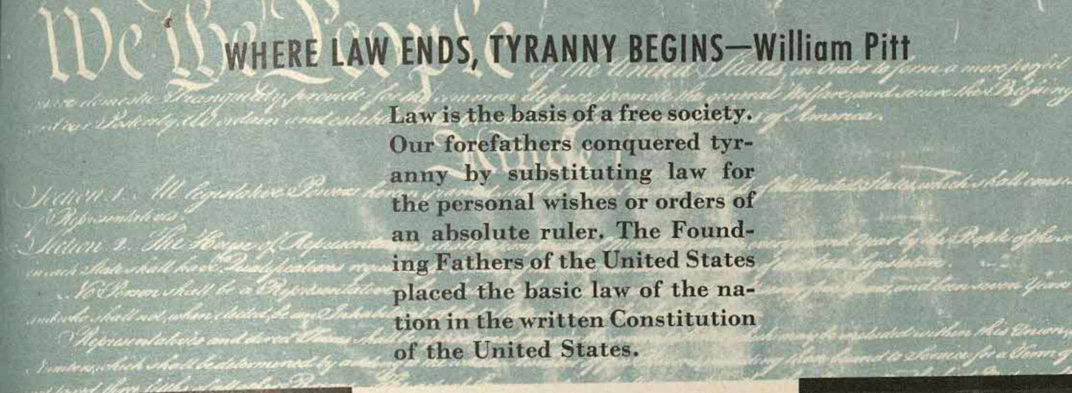
Scholars have searched in vain for the beginnings of law; they are lost in obscurity. Laws, no matter by what name called, were a necessity before the first historian penned a line. The rules of human conduct were, beyond doubt, first dictated by custom. Customs are social habits, and in time assume almost the binding force of statutes.

Two Original Sources of Law. Many people do not understand that not all laws have had their source in legislative enactments. Those laws which are passed and given force by legislation are known as *written* law; there is another kind, just as potent, just as binding, equally effective, known as *unwritten,* or *common* law.

Common law is derived from that great mass of the laws of England which do not reach back for their authority to definite legislative acts. How, then, did this body of laws develop? It consists, in general, of decisions conforming to popular custom and usage in particular cases, in rules and principles compiled from reports of cases which in an early day had been judicially decided upon their merits.

The English common-law system dates back to Anglo-Saxon times, to the days of the seven kingdoms, and numbers among its creators such men as Alfred the Great (849-901) and Dunstan (925-988), Archbishop of Canterbury. All that was best in the system of rules of the West Saxons and the Mercian and other kingdoms, enriched and strengthened by the intelligence of the Danes and Normans, became a heritage of the English people; and upon these beginnings succeeding generations built up a code of laws.

While the English common law was gradually evolving, another great system of laws was being preserved in continental Europe; namely the *Roman* law, which had developed under the sway of the great power of the early world, ancient Rome. An effort to introduce the body of the Roman law into England failed because of the loyalty of the early English to their own rough beginnings and to a conviction that they had a better basis of laws.


We the People

WHERE LAW ENDS, TYRANNY BEGINS—William Pitt

Law is the basis of a free society. Our forefathers conquered tyranny by substituting law for the personal wishes or orders of an absolute ruler. The Founding Fathers of the United States placed the basic law of the nation in the written Constitution of the United States.

■ Without a legislature, there can be no democracy, because the voice of the people cannot be heard. The great legislatures and parliaments of the democracies express the will of the people in making laws for their national problems. Left, the Capitol Building in Washington, D. C., where the Congress of the United States sits.

United Air Lines

Ewing Galloway

Laws need to be interpreted. ■ The regularly established courts of a nation do this in accordance with precedents such as the common law of the Anglo-American world or codes such as the Code Civil of France. The courts have long been regarded as guardians of liberty. Right, the Supreme Court Building in Washington, D.C. In the United States, the Supreme Court is the highest court in the land.

Laws must be enforced. Every ■ nation has a head of state who with his council of advisors administers the laws. Many administrative bodies and officials assist. Lower right, an official of the Pure Food and Drug Administration of the United States inspects a drug shipment.

Pure Food and Drug Administration

Beginnings of American Law. The common law of England is the basis of the law of all the states of the American Union except Louisiana, which adopted the *Code Napoleon* because the state was French in its antecedents. In most of the original thirteen states, it was provided that the English common law, and the English statutes relative to private law up to the fourth year of King James I (1606), should be accepted as law in the new states.

Other states, when they joined the Union, adopted the same English system of jurisprudence. In any of them, of course, the unwritten, or common, law became ineffective and inoperative when opposed in any particular to the constitution of the state or to its later statutes. The United States, it will be seen, has no common law of its own; its common law was borrowed from its motherland, and incorporated into the jurisprudence of its people.

The Constitution of the United States, with its various amendments, is the supreme law of the American Union. No law of Congress can override its authority; no state constitution can nullify for the state any of its provisions. A state law must of necessity conform to the plain provisions of the state constitution, and thus of necessity it must be in harmony with the Federal Constitution.

The Federal Constitution is interpreted by the Supreme Court of the United States; from its decision as to the constitutionality of a Federal statute there is no appeal; the supreme court in each state holds similar powers with respect to the enactments of its legislature. All decisions of Federal and state supreme courts are recorded and published, and become authorities for the guidance of inferior courts in all jurisdictions.

Consult the following titles for additional information:

Admiralty
Bertillon System
Bill of Rights
"Blue Sky" Laws
By-Laws
Capital Punishment
Civil Law
Code Napoleon
Commercial Law
Common Carrier
Common Law
Contract
Copyright
Court
Court of Claims
Crime
Deed
Estate
Fingerprint Identification
Guillotine
Habeas Corpus
High Seas
Homestead
Impeachment
International Law
Judge
Jury and Trial by Jury
Justice of the Peace
Justice, Department of
Juvenile Court
Labor Legislation
Martial Law
Mortgage
Navigation Acts
Neutrality
Notary Public
Oath
Parliamentary Law
Patent
Peer
Pillory
Primogeniture
Prison
Pure Food Laws
Reform Schools
Secret Service
Sumptuary Laws
Supreme Court of the United States
Title
Treadmill
Usury
Wheel

JURISTS AND LAWYERS

Blackstone, Sir William
Brandeis, Louis
Cardozo, Benjamin Nathan
Hughes, Charles Evans
Jay, John
Marshall, John
Reed, Stanley L.
Stone, Harlan Fiske
Taft, William Howard

LAW, John (1671-1729). A Scottish banker, John Law, originated in 1717 one of the world's greatest speculative ventures in the Mississippi Scheme. This was a plan to colonize and develop French territory in the Mississippi Valley, and it was coupled with a scheme for the management of the French national debt. The scheme collapsed in 1720, with huge financial losses for the stockholders, and Law was compelled to leave France.

Law, son of an Edinburgh goldsmith, had gone to England in 1691, but was forced to leave the country three years later because of a duel. He went to Paris, opened a private bank in 1716, and in the next year launched the Mississippi Scheme. See Mississippi Scheme.

LAWN TENNIS. See Tennis.

LAW'RENCE, James (1781-1813). Mortally wounded at the height of his career in the battle between the *Chesapeake* and the British vessel *Shannon,* James Lawrence was one of America's important naval commanders during the War of 1812. Born at Burlington, N. J., he joined the navy in 1798 and at the outbreak of the war was called to service under Com-

The Travelers Insurance Company

DIGGING UP OLDEST WRITTEN LAWS

At Susa, Iran, in 1901, archaeologists discovered the oldest written set of laws known to man. It was the code of King Hammurabi and governed the civilization of Babylonia 3,900 years ago.

The Babylonian nation had flourishing cities and big business. The laws showed that Babylonians could will, sell, lease, or give away property as we do at law today. There was much price-fixing—of rates of wages for workmen, rental of cattle to cultivate land or carry goods, and interest rates. One of the burdens of Babylonian business was high interest rates. There were rules for division of profits when the caravan merchant returned from his trips, rules for renting ships, and operating warehouses. Merchants paid by checks on banks.

The law was concerned with encouraging farming in dry Mesopotamia. Landowners and tenants were required to cultivate their land or suffer penalties, and also to irrigate in order to prevent flood damage. Treatment of debtors was lenient. They were permitted to pay debts with what they produced as well as money. Creditors could not seize growing crops for payment of debts.

A wife in Babylonia had her separate property which descended to her children, or went back to her family upon her death. If a man divorced his wife without a good reason, she retained her property and the children. A wife could sue for cruelty and neglect, and obtain a judicial separation from her husband.

The worst crimes were punished by death. The next class of crimes and negligence was punished by the rule of an "eye for an eye, and a tooth for a tooth." Lesser crimes and negligence was punished by fines. There was no imprisonment.

Babylonians were very careful about evidence for trials in their courts.

"DON'T GIVE UP THE SHIP!"
Shouted by the mortally wounded commander, Lawrence, these words became a navy motto.

modore Bainbridge. He was in command of the *Hornet* when it captured the *Peacock*, a victory which gave him command of the *Chesapeake*. His oft-quoted dying words, "Don't give up the ship!" became the motto of the United States Navy.

LEAD, *led*. Most common of all the heavier metals, lead is a bluish-gray mineral, soft, plastic, and melting at a low temperature—about 624° F. The symbol of this element is *Pb*, from the Latin word *plumbum*. Lead was used by the Romans for water pipes, and from their name for the metal comes our word *plumber*. Lead is widely distributed over the earth, and its most common ore is the sulphide, galena, which occurs in glistening, black cubic crystals (see GALENA). Lead carbonate is often associated with galena, and the ore always contains small amounts of silver and sometimes small quantities of gold.

Lead readily forms alloys with most other metals, and makes many useful products. Among them are *type metal*—an alloy of bismuth, tin, antimony, and lead; *solder*, a tin-lead alloy; *bearing metal*, an antimony-tin-lead alloy; *fusible metal* for safety plugs in steam boilers, made of bismuth, tin, and lead; and *pewter*, which is chiefly a tin-lead alloy with sometimes small amounts of copper, antimony, and zinc. *Hard shot* or *bullets* are composed largely of lead alloyed with a small amount of antimony (see ALLOYS).

An important use of lead is for paint. White lead (lead carbonate) and lead oxides are the most common lead pigments. Lead oxide is used also in making cable covering, storage batteries, enamels, glass, pottery, rubber tires, and varnish. Many lead compounds are used as drugs. Lead arsenate is an insecticide. Tetraethyl lead, a compound, is used to take the "knock" out of gasoline. The metal is used to shield human beings from deadly atomic radiation. The "lead" in pencils is actually graphite.

The United States leads in producing lead but also imports large quantities. American production centers include Missouri, Idaho, Utah, and Oklahoma. Mexico, Australia, Canada, Germany, and Russia are other major sources of lead.

LEAF. See LEAVES.

LEAGUE OF NATIONS. See NATIONS, LEAGUE OF.

LEAN'DER. See HERO.

LEAP YEAR. Because a year having 366 days includes, or "leaps" over, an additional day, it is called leap year. Each year which can be exactly divided by four is a leap year unless it ends in two ciphers; in the latter case it must also be divisible by 400. For example, 1900 is divisible by four, but not by 400; hence it was not a leap year. In 46 B. C. it was discovered that the calendar was ahead of the season because the early Romans had reckoned the length of the year incorrectly. Julius Caesar adjusted this error by adding ninety days to the year 46 B. C. and then adding one extra day, February 29, every four years. Pope Gregory XIII in 1582 made a second adjustment by decreeing that there should be no leap years on century dates except those divisible by 400. See CALENDAR.

LEATHER, *leth'ur.* Fashion has brought the skins of many different animals into common use in shoes, handbags, and other leather articles, but the most important sources of leather are hides of cows and horses. Garments made from animal skins have been used by man longer than any

HERE ARE SEVERAL PAIRS OF SHOES

Though perhaps it doesn't seem so. The men are tanners, making a hide into leather, in preparation for the cobbler's last and thread. What the leather is used for depends on the tanners.

other clothing, and the preparing of leather was practiced by the earliest civilized peoples. Most leather is made from the middle layer of animal skins, its preparation requiring expert treatment at every step.

Preparation. When the raw hides reach the tannery, they are soaked in water containing salt or carbolic acid, then are kneaded by machinery. To remove the remaining hair and flesh, they are next placed in vats containing a lime solution but are frequently exposed to the air. The hair thus loosened is then scraped off by hand or machinery. After the hides have been washed to remove all traces of the lime, they are ready for the tannery.

There are three main types of tanning: *vegetable,* in which the tanning agent, or *tannin,* comes from some plant, such as hemlock bark or quebracho; *mineral,* or *chrome,* where certain mineral salts are employed; and *chamois,* in which bran and alum are used. Some tanning requires months; other kinds, only a few hours. Leathers designed to undergo hard usage are vegetable-tanned. Those requiring less strength are minerally tanned, unless soft, pliable ones, such as sheepskin and goatskin, are being treated, when chamois tanning, or *tawing,* is used.

Kinds. The horsehide and cowhide used for shoe soles come from the thick skin on the animals' backs; shoe uppers and other moderately heavy leathers, from the lighter portions of these hides or from the skins of calves, sheep, goats, or other small animals. Goatskin provides kid and *morocco;* waterproofed horsehide, the *cordovan* extensively used in shoes. Other leathers come from the skins of mules, oxen, peccaries, deer, elk, snakes, alligators, crocodiles, lizards, ostriches, and other animals. *Patent leather* is made by coating the tanned skin with lampblack and oil, allowing each coat to dry, then rubbing the skin with pumice stone. After applying the finishing coat, which contains varnish, the leather is baked. Other specially treated leathers include *suede,* which is buffed; *boarded,* which is given patterns resembling creases; and *embossed,* into which designs are pressed.

Artificial Leathers. Since the demand for leather exceeds the supply, much artificial leather is now used. Modern substitutes include *pantasote,* made by a secret process, and *fabrikoid,* which is cotton cloth coated with nitrocellulose and polished. Some artificial leathers are so like leather in appearance that few persons can distinguish between them and the genuine article.

LEATHERBACK, or LEATHERBACK TURTLE. Largest of all turtles, the leatherback gets its name from its soft, brown, leathery shell. Some specimens are six to eight feet long and weigh well over a thousand pounds. Found in all tropical seas, but most often in the western part of the Atlantic Ocean, leatherbacks sometimes travel as far north as Long Island in the United States and France in Europe. Their flesh is not edible.

LEAVES, *leeves.* The leaves of a plant are its very "organs," without which it must wither and die.

All plants absorb inorganic matter, chiefly carbon dioxide, from the air and "organize" it into organic materials upon which the plants feed. Much of this work is done by the leaves. Water is transmitted to the leaves from the stems and roots. The leaves break up the water and carbon dioxide into their elements of carbon, hydogen, oxygen, and reunite them into new compounds, finally changing them into sugar and starch to be used by the plant in cell building. In the inner cells of the leaves is the substance *chlorophyll,* which gives leaves their green color. This substance has the power of taking energy from the sunlight and holding it until it is used in the process of making starch and sugar.

Leaves also serve as the lungs of a plant, absorbing oxygen from the air and giving off carbon dioxide. In this absorption of air, certain substances are decomposed, releasing energy to aid the plant in its work. As the starch is created, much more oxygen

Weyerhaeuser Company

LEAVES ASSIST BOTH MAN AND ANIMALS

Besides providing shelter for wildlife, they are the green food factories of plant life.

is given off than is used. Animals use the oxygen, giving off carbon dioxide, which is in turn used by the plants.

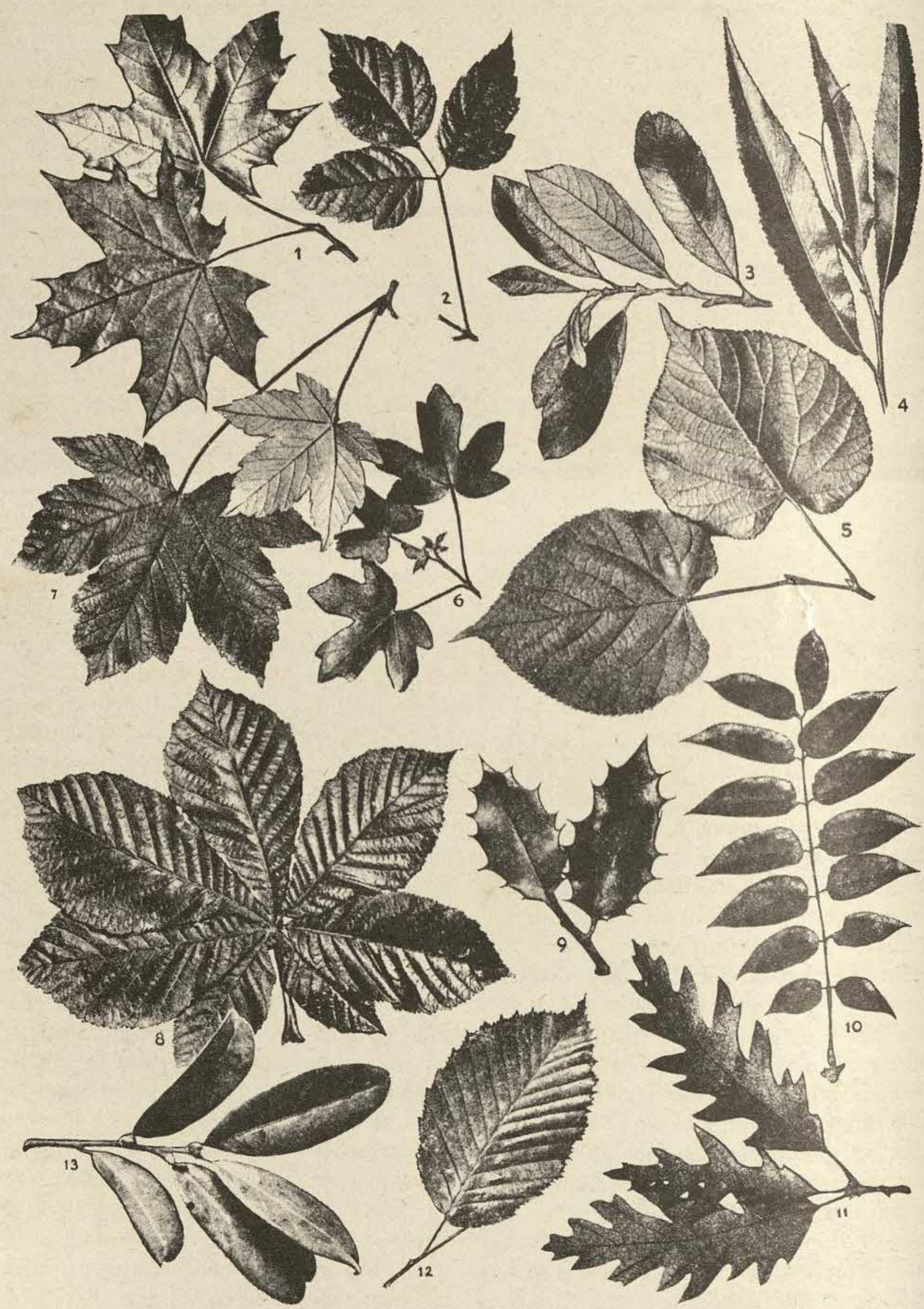
Another function of the leaves is transpiration, in which the plant gives off the excess moisture of the sap into the air.

The Parts of Leaves. A complete leaf is made up of three parts, the *blade,* the *leafstalk,* and the *stipules.* When the blade is all in one piece, the leaf is said to be *simple;* when it is divided into leaflets, the leaf is classed as *compound.* The blade is made of a green pulp or cellular substance, given body by a network of veins. Over this framework is stretched a thin membrane of skin, called the *epidermis.* This covering contains hundreds of tiny "breathing" pores," called *stomata.* So tiny are they that there are nearly 100,000 of them on the underside of an apple leaf. It is on the blade of the leaf, therefore, that the real work is performed. The leafstalk attaches the blade to the twig. The stipules are tiny leaflets found at the base of the leafstalk.

Venation. The manner in which the veins are arranged in the leaf blade is called the leaf's *venation.* Some leaves are *netted-veined,* where small veins branch off from larger ones and then subdivide, covering all parts of the leaf. Other leaves are *parallel-veined,* all veins running parallel or near to each other from stem to apex. Still others are *pinnately veined,* like the veins of a feather. *Palmately veined* leaves have the ribs spread out in much the same manner as the spreading fingers of the hand.

Other Characteristics. Leaves may vary in shape from almost perfectly round to long and extremely slender. Their margins may be saw-toothed, jagged, wavy, or perfectly smooth. On a twig, leaves may have opposite arrangement, in which a leaf on one side perfectly balances one on the other side. Or they may be alternately arranged, in which the leaf on one side appears slightly above or below the corresponding leaf on the opposite side.

Variations. Curious and interesting are some of the variations in leaves. The "storage" leaves of the century plant, for example, hold water there to be used on dry days. The leaves of the barberry terminate in thorns, which serve as protection for the plant. The leaves of the pea develop into tendrils for climbing. The leaves of the pitcher plant hold water, into which insects are lured and in which they drown. Interesting, too, are the leaves of Venus's-flytrap, which close suddenly on an alighting insect and hold it until this cannibal-



CAN YOU RECOGNIZE THE TREES BY THEIR LEAVES?

Leaf shapes and color reveal a tree's name clearly. (1) Norway maple. (2) Box elder. (3) Sallow tree. (4) Crack willow. (5) Lime tree. (6) Field maple. (7) Sycamore. (8) Horse-chestnut tree. (9) Holly. (10) Walnut. (11) Turkey oak. (12) Hornbeam tree. (13) Laurel. Nearly all these and hundreds of other species will grow abundantly in a temperate climate like that of the United States. And their leaves are the simplest identification tags for the amateur naturalist who wants to know his friends, the trees.

like plant has digested the helpless victim.

Leaves in the Autumn. When cool weather arrives, the leaves of trees seem to realize that the year's work of making food is over and cease their labor, for during the winter months the plant is kept alive by using food that has been stored up in its cells. Accordingly, the green chlorophyll "breaks camp," decomposes into its various substances, and sends what food remains to the tree cells to be stored. When this chemical change takes place in the chlorophyll, the leaf begins to lose its green color and changes to a more brilliant hue. Where the leaf stem joins the twig, a layer of cork cells begins to form, causing the leaf to break off at this point, falling to the ground. See PLANT; TREE.

LEBANON, *leb' a nun.* Fringing the eastern Mediterranean coast, with Israel to the south and Syria to the north and east, Lebanon covers only 3,475 square miles. Rising almost directly behind its narrow coastal plain are the towering Lebanon and Anti-Lebanon ranges, between which snuggles the high, fertile Bekáa Valley, the nation's "breadbasket." Although little of this mountainous land is under cultivation, agriculture is the chief occupation of its 1,525,000 people.

Lebanese crops include tobacco, grains, vegetables, melons, grapes, olives, and citrus fruits. Mulberry trees also are cultivated, and some silk is made. Cattle, sheep, and goats are grazed, and wool is a leading export. Other industries include the making of tobacco products, olive oil, and cotton cloth. Lebanon has few minerals and no oil, but it refines some of the petroleum piped to its ports from nearby countries and reships the remainder. In fact, its prosperity is based on the Near East-Western trade it handles.

The busiest port is Beirut, the capital and the nation's transportation hub. It is also connected with Lebanon's neighbors by rail and road and with the rest of the world by sea and air. The country's semitropical climate, coastal and mountain scenery, points of historic interest, and fine resorts attract tourists from many countries.

Most Lebanese are Arabs. Slightly more than half are Christians and most of the rest are Moslems. Arabic and French are the chief languages.

Formerly under Turkish rule, later a French mandate, Lebanon became an independent republic in 1941. It is a member of the United Nations and it belongs to the Arab League.

In July, 1958, United States Marines were sent into Lebanon at the request of its president. He feared that an uprising in Iraq might spread to Lebanon through the encouragement of Egypt. The Marines were withdrawn in October, 1958, shortly after the election of a new president, General Fuad Chehab.

LEE, CHARLES (1731-1782). An unpatriotic officer, Charles Lee gave America little aid in the Revolutionary War. Son of a British army officer, he fought under Braddock in the French and Indian War, but sided with the Americans at the outbreak of the Revolution and was given the rank of major general. Following the siege of Boston, he was placed in charge of the fortifications of New York and later took part in the Battle of Charleston, which was won by General Moultrie, but for which Lee was given credit. In 1776 Lee was captured by the British, gave them Washington's military plans, and, upon being exchanged, in 1778, disobeyed orders at the Battle of Monmouth, almost causing an American defeat. Lee was suspended from his command after a court-martial. He later wrote an impudent letter to Congress and was dismissed from the army.

LEE, HENRY (1756-1818). "First in war, first in peace, first in the hearts of his countrymen." This memorable eulogy of George Washington, delivered in a funeral address before Congress, was made by Henry, "Light-Horse Harry," Lee, himself a brilliant soldier and statesman. A member of an illustrious family, Lee was born near Dumfries, Va., and was educated at Princeton. He became a captain in a Virginia regiment in 1776, and a year later joined Washington at Brandywine Creek as cavalry leader. In the historic retreat of Nathanael Greene before Cornwallis, he led the rear guard which protected the army.

In recognition of his unswerving loyalty and brilliant leadership, Lee was elected to Congress when the war ended and later became governor of Virginia. Although he had retired from public life in 1801, he was appointed a major general in 1812. Five years earlier, he had become the father of Robert E. Lee, who was to become commander of the Confederate forces in the Civil War.

LEE, Richard Henry (1732-1794). Although Richard Henry Lee never took the field during the Revolutionary War, he brought added glory to that great American name in the council chamber. He was born at Stratford, Va. Lee was a member of the House of Burgesses and a delegate to Continental Congress in the years before the war. In both places he took a leading part, particularly in the drafting of papers to the king, which were unequaled for statesmanship. It was he who introduced the motion, on June 7, 1776, recommending a declaration of independence from Great Britain.

During the war he rendered valuable aid back of the lines, his poor health prohibiting any military part. In 1784 he was elected president of Congress by a unanimous vote. Lee was not in favor of the Federal Constitution; but when it was adopted, he became one of the Senators from Virginia. See Declaration of Independence.

LEE, Robert Edward (1807-1870). Universally admired and respected, Robert E. Lee was the brave leader of the Confederate forces in the tragic war against the North. In addition to his idealism and self-sacrifice, Lee is remembered as one of the most skilled generals in history.

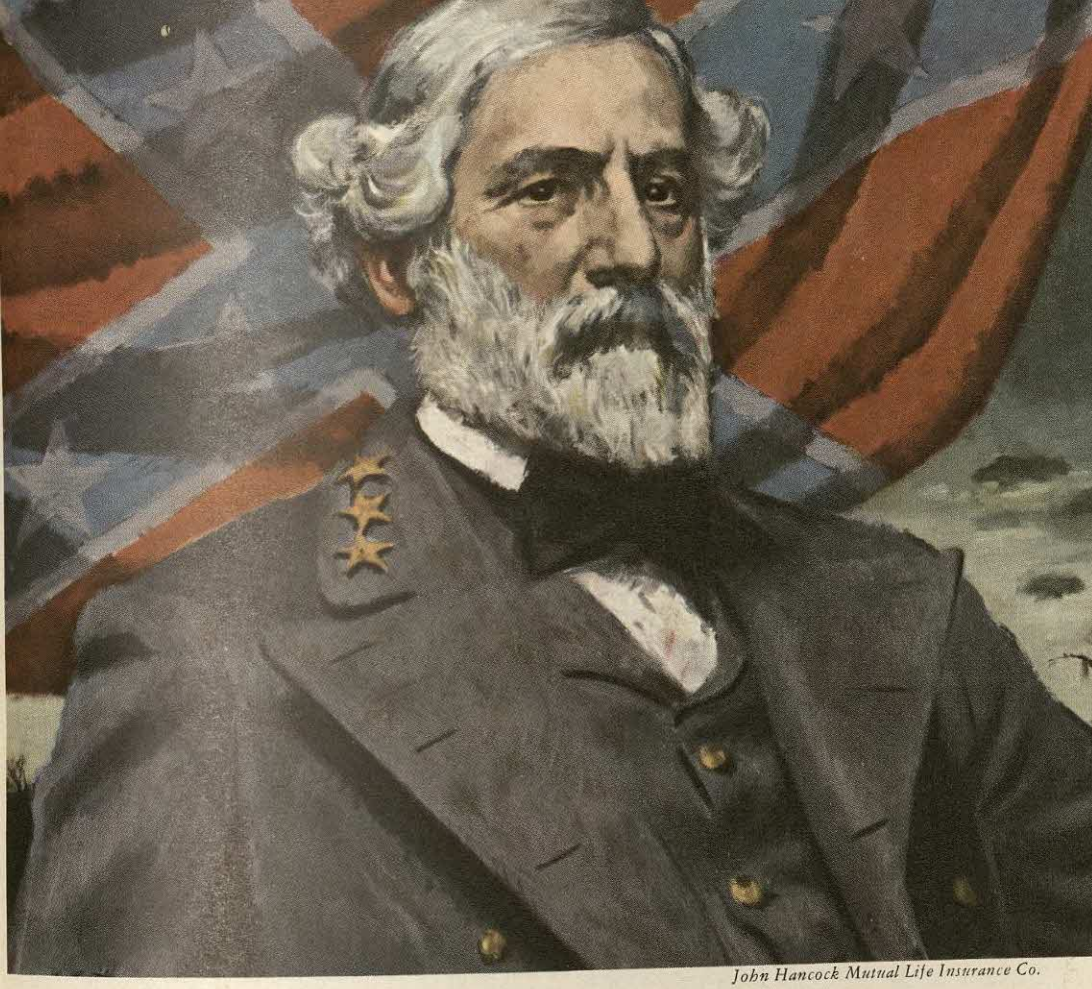
Lee was born on January 19, 1807, at Stratford, Va., the son of the Revolutionary hero, "Light-Horse Harry" Lee. Following in his father's footsteps, he entered upon a military career and attended West Point. Graduating in 1829 as second lieutenant of engineers, he eventually became chief engineer of the army and had charge of the construction of defenses for New York. In 1847 he was chief engineer of the army in the Mexican War. He was superintendent of military studies at West Point from 1852 until 1855, when he became colonel of cavalry. He commanded the force which checked John Brown's raid at Harper's Ferry in 1859.

At the opening of the Civil War, Lee was colonel of the United States Army regiment in Virginia. Like many other Southern officers, he was opposed to secession but was intensely loyal to his state; and when Virginia finally seceded, he resigned his commission in the army reluctantly and assumed command of the Virginia forces. Later he was appointed commander in chief of the Confederate Army and served in that capacity throughout the war.

In the first two years of the war, Lee was successful in driving back the Union army in its attempts to capture Richmond. In 1862 he defeated McClellan in a number of battles, and, with "Stonewall" Jackson, won the Battle of Manassas Junction, or Bull Run, in August of that year. Later he invaded Maryland, was checked at Antietam, but in December completely routed his opponents at Fredericksburg, Va. In May, 1863, he won a victory over Hooker at Chancellorsville and started his second invasion of the North, which was checked at Gettysburg.

From then on Lee's campaign was one of stubborn defense; but, in spite of his remarkable strategy, he was unable to withstand the larger and better equipped Northern army under the command of General Grant. Surrounded, and cut off from reinforcements, Lee surrendered on April 9, 1865, at Appomattox Court House.

The war impoverished Lee, but he disdained offers that would make him wealthy. The great general chose instead to set an example for the South and accepted the modestly paid position of presi-



John Hancock Mutual Life Insurance Co.

HE LOST A WAR, BUT WON ENDURING FAME IN HISTORY

Generous, gifted, and brave, Robert E. Lee rose above defeat to help build America to new heights.

dent of Washington College at Lexington, Va. There, with dignity and pride, he sought to heal the wounds of the war. He died in 1870, mourned by North and South alike; and, in his memory, the name of the college he headed was changed to Washington and Lee. His home at Arlington has now become a national shrine. See Civil War in America.

LEECH. Among the worms with ringed bodies are the blood-sucking leeches. Most of these worms live in fresh water, but some are found in the sea; and a few, in the tropics, live on land. All of them are carnivorous, feeding on other animals. The bites of tropical land leeches are sometimes fatal. In Egypt there is a fresh-water leech which causes internal hemorrhage when the parasite is swallowed in drinking water.

At each end—sometimes only at one end—of its body, a leech has a sucking apparatus. By attaching its forward sucker to an object, then curving and shortening its body and attaching the rear sucker, it is able to move about, either in or out of the water. It uses somewhat the same motion in swimming. Some leeches can absorb enormous quantities of blood. Formerly leeches were used by physicians to draw blood from patients. They are now sometimes used to draw blood from a blackened eye.

LEEUWENHOEK, *la'ven hook,* ANTHONY VAN (1632-1723). By arranging several magnifying glasses into a rude microscope, Anthony van Leeuwenhoek saw the "invisible" world of bacteria and thus advanced medical science. Although he did not pretend to be a trained scientist, his interest in natural science led him to make several important discoveries. He showed the structure of the red blood corpuscle, and his investigations explained how the blood circulates through tiny capillaries. His research on bacteria proved the falsity of the theory that these minute bodies were spontaneously produced, and his work in this field paved the way for the further development of bacteriology.

LEE'WARD ISLANDS. Made up of a number of the West Indies, the British-owned Leeward Islands comprise a total area of 425 square miles. The group consists of four territories: Antigua, Saint Christopher-Nevis-Anguilla, Monserrat, and the British Virgin Islands. In 1958 the Leewards became part of the West Indies Federation. The chief products are molasses, sugar, tobacco, fruits, and cotton. The population is about 134,000. Saint Johns and Charlestown are the leading cities. See WINDWARD ISLANDS.

LEGAL TENDER. See MONEY.

LEGEND, *lej'end,* or *le'jend.* In modern literature a legend is a story which is not necessarily true but which the author may wish his readers to think of as true, at least while they are reading the story. An example is Irving's *Legend of Sleepy Hollow.* Legends may also be tales of heroism and valor, which are handed down from generation to generation among all groups of people, as in the case of the American Indian legends. The term originally referred to the lesson book of the early Church and afterward came to be applied to the collections of remarkable stories relating to the saints and martyrs.

LEGERDEMAIN, *lej ur de mane'.* When a "magician" plucks silver dollars out of the air, he is performing legerdemain, or tricks done so quickly and unnoticeably that his audience is deceived. His success depends on two things—his ability to distract the attention of his audience from the trick without their realizing it, and his skill of hand. The simplest tricks are usually performed by transferring objects from one hand to the other or by substituting one object for another; others may be performed with the aid of mechanical devices operated by either the performer or his assistants. Sleight of hand is still a popular entertainment.

LEGION, *le'jun.* Ancient Roman armies were divided into legions, bodies of infantry of from 3,000 to 6,000 men. Often the legion was supplemented by cavalry. Each legion was divided into ten cohorts, each cohort into three maniples, and each maniple into two centuries. In the legion were sixty centurions, sixty optiones, or lieutenants, and standard-bearers. The standard of the legion was an eagle.

LEGION OF HONOR. One of the greatest honors that can be bestowed on any person, be he soldier or civilian, Frenchman or foreigner, is membership in the French Legion of Honor. Founded in 1802 by Napoleon, the society has undergone numerous changes. Members now rank as chevaliers or knights, officers, commanders, grand officers, and grand crosses. Because of indiscriminate granting of memberships in previous years, membership has been somewhat restricted to restore the institution to its former high standing. The emblem of the Legion is a five-pointed star of white enamel; on one side it bears the figure of the Republic and the inscription *République Française,* and on the other side two flags and the inscription *Honneur et Patrie* (Honor and Country).

LEG'ISLATURE. Most governments have a special department, the legislature, whose function is to make, alter, or repeal the nation's laws. Under a democratic form of government, the legislature is made up of representatives chosen by the people for whom it makes the laws.

The Congress of the United States consists of the Senate and House of Representatives, whose members are elected by voters in the states. Laws passed by Congress apply to the entire nation. Laws made by any of the 50 state legislatures apply within the state.

The Parliament of Great Britain makes laws for the United Kingdom and Northern Ireland. The Parliament of Canada makes laws on matters of national scope, while laws concerning each province are made by the province council.

Australia has a Parliament of representatives from six states and two territories. The Parliament of the Union of South Africa consists of representatives of four provinces. See Congress of the United States; Parliament.

State Legislatures. The separate constitutions of the various states of the United States prescribe the size of the state legislatures. They meet in the state capital. Usually the legislature is composed of two houses. The legislature of Nebraska has a one-house legislature. Terms of legislators vary from state to state. Legislative sessions usually are held every other year.

See the sections on Government in the separate state articles which appear in these volumes.

LEGUMINOUS, *le gu'min us,* **PLANTS, or PULSE FAMILY.** The leguminous plants rank second in importance only to the grasses and second in number only to the composites. They may be trees, herbs, or shrubs.

The fruit of the typical leguminous plant is a pod, or *legume*. The leaves are usually the three-sectioned type, as in the clover, although in some cases several leaflets occur on each side of a central stalk. Many of these plants, such as the peas, send out tendrils from their leaves to assist the plant in climbing. The largest leguminous plants known are the giant acacia trees of Africa and Australia.

The Uses of Legumes. The legumes are important as human and stock food. Because they are rich in protein, they provide a valuable supplement for the cereal grains. Alfalfa, clover, cowpeas, and soybeans are widely used for hay. They are important as rotation crops, and are often plowed under to furnish nitrogen to the soil.

The bean and pea rank next to the various grains as human food. Soybeans are employed in the preparation of chop suey. They are a common food in China and Japan, and are valuable in a diet requiring a minimum of starch. Soybean oil is widely used in the manufacture of paints, varnish, and other products.

Consult the following articles for descriptions of various legumes:

Acacia
Alfalfa
Bean
Clover
Cowpea
Honey Locust
Pea
Soybean

LEIBNITZ, *lipe' nitz,* Gottfried Wilhelm, Baron von (1646-1716). The contributions of Gottfried Wilhelm Leibnitz to mathematics and philosophy place this German scholar among the world's greatest thinkers. His philosophical theory of *monadology* was in many ways the forerunner of the modern atomic theory, and he gave the differential calculus to the science of mathematics.

Born at Leipzig, Leibnitz studied at the university there, and at the age of seventeen wrote a philosophical essay. After a period of study in mathematics in Paris, he went to England, where he became a member of the Royal Society. It was at this time that he discovered the differential calculus. He shares the honor for this discovery with Newton, although the two worked independently. He then returned to Hanover after the Duke of Brunswick-Lüneburg had given him the office of councilor and granted him a pension. Leibnitz later assisted the elector of Brandenburg to form the Royal Academy of Sciences at Berlin, of which he became life president.

LEICESTER, *les'tur,* Robert Dudley, Earl of (about 1532-1588). The famous lord of Kenilworth Castle in Sir Walter Scott's novel *Kenilworth* was really Robert Dudley, Earl of Leicester, courtier and favorite of Queen Elizabeth. His wife was Amy Robsart, who died under mysterious circumstances in 1560. Since it was believed that he had a part in her death, Leicester was very unpopular. Queen Elizabeth was, however, fond of him, and gave him his title and many other gifts. But when it appeared that she might marry Leicester, people protested so vehemently that the queen was obliged to renounce the idea publicly. See ELIZABETH.

LEIF ERICSON, *leef air′iḳ sun.* See ERICSON, LEIF.

LEM′MING. There are two groups of these rodents of the north, the *Norway,* or *brown,* lemmings and the *banded* lemmings. Both are found in the Arctic regions of both hemispheres, but the former are most abundant in Scandinavia, and the latter in Canada and Alaska.

Lemmings are remarkable for the rapidity with which they multiply. Sometimes the grasses upon which the Norway lemmings feed cease to be available in a locality. Then the creatures migrate to other parts in immense swarms. In these migrations they devour nearly every green thing upon which they come. They cross mountains, swim lakes or rivers, and even apparently try to cross the sea, for, when they come to it, they plunge in and keep swimming until they die. These migrations are useful, as they rid the country of a rodent population which might otherwise make living difficult for other animals whose food is vegetable matter.

Lemmings look like stumpy-tailed field mice. They are about six inches long, and their heads are quite large. The lemmings of the Polar regions have no external ears; those in Scandinavia have small, rounded ears. The banded lemming is remarkable for the fact that in winter its coat changes to pure white.

RATS' ARCTIC KIN

Lemmings are found in northern sections of the world. The European lemmings sometimes migrate in huge herds, destroying everything edible in their way. American species have no such habit.

LEMON. A native of India, the lemon has come to be one of the most useful fruits of the American household. It is a member of the citrus group and botanically is similar to the orange. Lemon trees, however, are less hardy than orange trees. They are raised in only the warmest sections of the United States—in Florida, California, and along the Gulf of Mexico. California produces the greater part of the American crop. The fruit is also raised extensively in Southern Europe.

The lemon tree seldom exceeds twenty feet in height. It bears small, purplish flowers and oval leaves. Lemons are picked green from the tree, generally in March and April, and are ripened in a dark room. They are stored until summer, when they find popular use as a flavoring and as a base for cool beverages. The fruit juice is also used in making citric acid and in the printing of calico. The peel of the lemon in converted into lemon extract, used in cooking. Lemon juice is an important source of Vitamin C.

American Museum of Natural History

KEEPS COOL IN A FUR COAT
Lemurs like hot climates and live in trees.

LE'MUR. Lowest of the Primates, the group of lemurs and lemuroids includes animals between the monkeys and the apes. Two thirds of the group are found on the island of Madagascar. The remaining lemurs are distributed over lower India, Africa, and the Philippine Islands. Their name is the Latin word for *ghost,* and was given to these animals because of their pointed, ghostlike faces and their habits of prowling about and feeding at night. Most lemurs have long tails, the common *ring-tailed* lemur having a long tail with alternating black and white rings. The lemurs are perfectly harmless, in spite of their weird faces. They feed upon leaves, fruits, insects, small snakes, and birds' eggs.

LENGTH OF LIFE. See LONGEVITY.

LEN'IN, NIKOLAI (1870-1924). Father of Russian Communism and the greatest revolutionist of the twentieth century, Nikolai Lenin had the peculiar distinction of being born of well-to-do parents but dying revered by the revolutionary working classes.

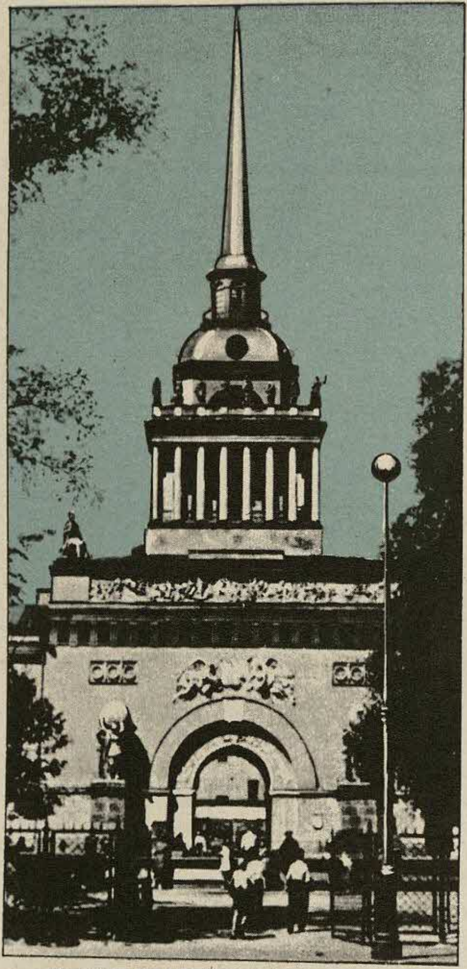
Lenin, whose real name was Vladimir Ilich Ulianov, was born at Simbirsk in Czarist Russia. At the age of twenty he became leader of the radical socialist party and later was exiled to Siberia. His political career began with his election to the Duma, or national legislature, following the revolt of 1905. Expelled from that body, Lenin took up residence in Cracow, Galicia, moving to Switzerland during the First World War.

In the midst of the Russian Revolution, this follower of the philosophy of Karl Marx returned to Russia and sought to overthrow the provisional government. Gaining ground, Lenin and his associate, Leon Trotsky, acquired popular support by November, 1917, and the All-Russian Congress of Workmen's and Soldiers' Delegates named Lenin head of a new Cabinet. In February of the following year, Russia withdrew from World War I, and the Bolshevism of Lenin ruled the country. In 1921 he established the Soviet Union. His tomb in Moscow's Red Square is a national shrine that has been visited by millions.

A shrewd, intolerant, able leader, Lenin stands out as probably the most influential Slavic figure of modern times. See COMMUNISM; RUSSIA; STALIN, JOSEPH.

LEN'INGRAD, RUSSIA. A city which has witnessed many of the important events in the modern history of Russia, Leningrad stands proud and isolated in the cold, bleak region of Northwest Russia. The country's second largest city and once the capital, the "city of Lenin" is located at the point where the Neva River enters the Gulf of Finland; it is 400 miles northwest of Moscow. The Neva divides into many branches at this point, and the city is composed of numerous islands connected with bridges. The land is low, and dikes and canals have been constructed to protect Leningrad from floods.

Leningrad began its long history in 1703 when Peter the Great decided to build a new capital city in place of Moscow. It remained the capital until 1918, when Mos-



IN THE SOVIETS' SECOND CITY
Admiralty Building, the heart of Leningrad.

cow again became the capital. Originally Saint Petersburg, the name was changed to Petrograd in 1914, which was used until the city was given its present name by the Soviet government in 1924. Under Soviet rule, Leningrad at first declined, but by 1925 had started a new growth. It was besieged by the Germans during World War II with surprisingly little damage to its historic shrines. The population is about 3,300,000.

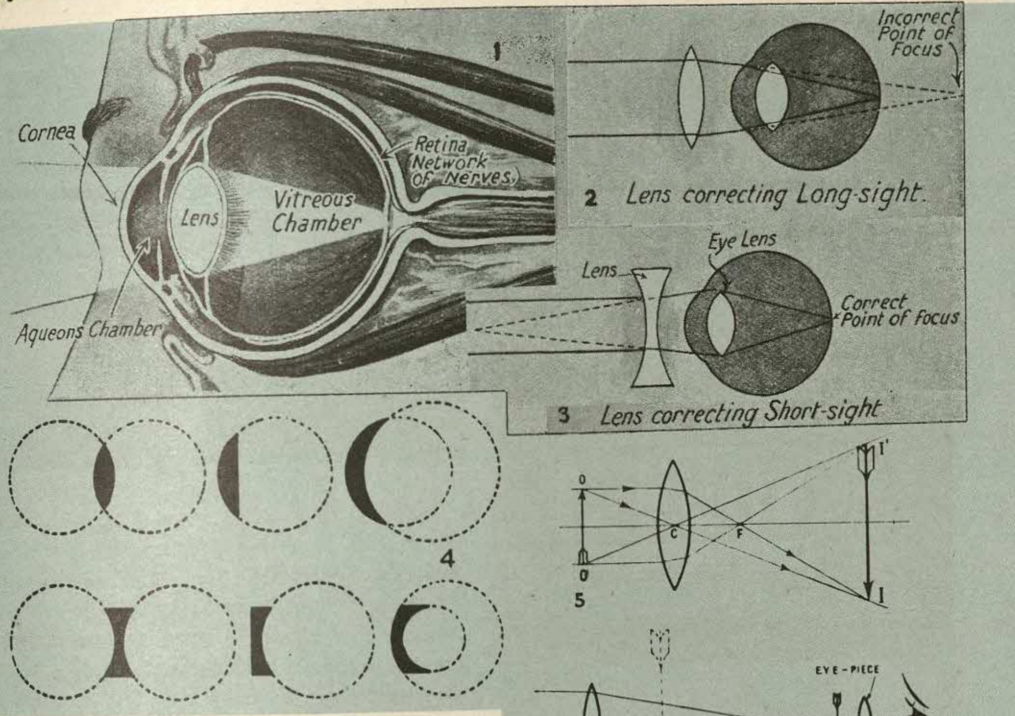
Despite the fact that Leningrad is situated very far north and its harbor is blocked with ice part of the year, the city is an important trading and industrial center. The leading products are textiles, rubber goods, grain, timber, leather, machinery, and various stone products.

Prominent among Leningrad's educational institutions are the Leningrad State University, the Academy of Sciences, and many industrial and technical schools, and the Soviet State Library, which contains over a million volumes. See RUSSIA.

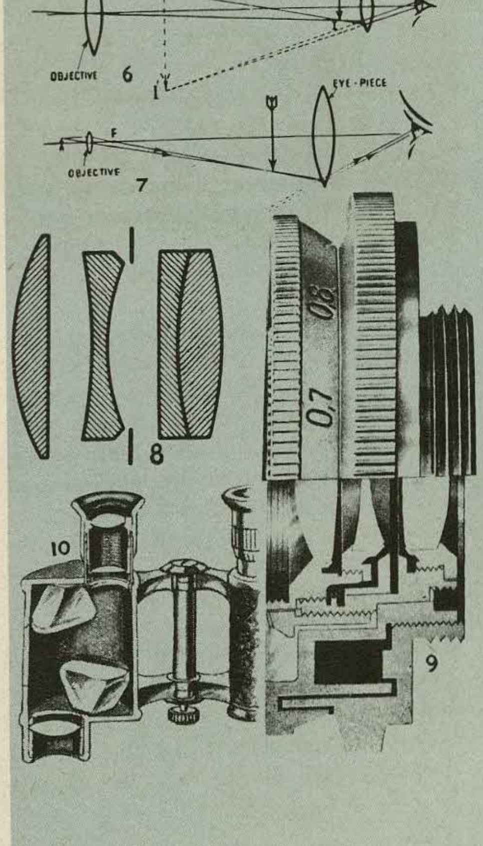
LENS, *lenz.* One part of the eye is a lens, a transparent body, curved to bend rays of light and concentrate them at a focal point, the retina, thus causing the eye to "see." Curved and polished pieces of glass are lenses made to assist the eye in such optical instruments as spectacles, telescopes, field glasses, microscopes, and all manner of magnifying and reducing glasses. Spectacles are used to correct vision, microscopes and telescopes to add to vision. The lens of a camera concentrates rays of light so that they will fall on the sensitive plate or film, and the lens of a stereopticon or moving-picture machine spreads rays from a tiny picture so that they cover a large screen.

Focus. If we hold a magnifying glass so that rays from the sun pass through it onto a piece of paper, we find that when we move the glass back and forth, the circle of light on the paper grows larger and smaller. We can make it so small that the concentrated rays will set fire to the paper. The point of greatest concentration is called the *principal focus* of the lens. A lens which has such a focus is called a *converging* lens, because rays which enter the lens parallel with each other are brought together, or *converged. Diverging* lenses have no principal focus, for they spread the rays out instead of bringing them together.

Anyone who uses a camera should have a thorough understanding of the principles of focusing. Much can be learned by experimenting with a simple lens and a candle. The camera enthusiast ought to know why some lenses take better pictures than others, especially if he contemplates buying a high-priced camera or a special



SEEING THE WORLD WITH LENSES
(1) The eye: nature's own lens. Light goes through the adjustable lens, concentrates on the retina, and passes to the optic nerve. (2 and 3) Proper lenses bend the light to correct visual error. (4) Lenses are parts of circles: all based on the fact that light bends toward thickest part. (5) Production of an image by a convex lens. (6) In telescopes. (7) In microscopes. (8) Compound camera lens. (9) The same lens mounted. (10) Prismatic field glasses.



lens. The principal thing to know is that an ordinary spherical lens does not focus the rays that pass near its edge. See CAMERA; EYE; PHOTOGRAPHY.

LENT. In the early Christian Church it was customary to observe the last two days before Easter as days of penitence. Later, all of Holy Week was included, and by the time of the Council of Nicaea (A. D. 325), the period had been lengthened to include forty days, in remembrance of the fasts of Jesus, Elijah, and Moses. Fasting came more and more to be the accepted sign of penitence, and in time the idea of self-denial practically replaced the original idea. As it seemed inconsistent to fast on Sunday, which was a day of rejoicing in memory of the Resurrection, the four Sundays were omitted and four other days added at the beginning of the period, causing it to commence on a Wednesday, afterward known as *Ash Wednesday.*

The name Lent was originally merely the word for *spring,* occurring in the Anglo-Saxon as *lencten* (the time of lengthening days), in the German as *lenz,* and in the Dutch as *lente.* Lent is observed by nearly all Christian bodies.

LEN'TIL. One of the first food plants cultivated by man, the lentil is an Old World legume of historic interest. The red pottage of Bible story, for which Esau sold his birthright, was probably a dish of red lentil seeds. There are other varieties having gray and black seeds. These seeds, which are used in making soups and stews, contain a good deal of nutriment, being rich in protein and carbohydrates, but are not equal in flavor to peas or beans, and have never become a staple vegetable food among Americans. The lentil is cultivated extensively in its native home, the Mediterranean region, and the seeds found in American markets are imported.

The lentil is a hardy annual with a weak, much-branched stem which reaches a height of about eighteen inches. Its seed pods are short, broad, and very fat. The herbage of the plant, when cured, makes a good stock food, and is especially suitable for dairy cows.

LEO. Five of the thirteen Popes named Leo are of particular importance in the development of the Roman Catholic Church.

Leo I, who ruled from 440 to 461, greatly strengthened the power of the Church and the Pope. He saved Rome from destruction when Attila advanced upon the city in 452, and in 455 prevailed on the conquering Genseric to spare many of the beautiful buildings.

Leo III was Pope from 795 to 816. He crowned Charlemagne Emperor of the West and thus opened a great period in the development of medieval Europe.

POPE LEO XIII
Noted for his learning and statesmanship.

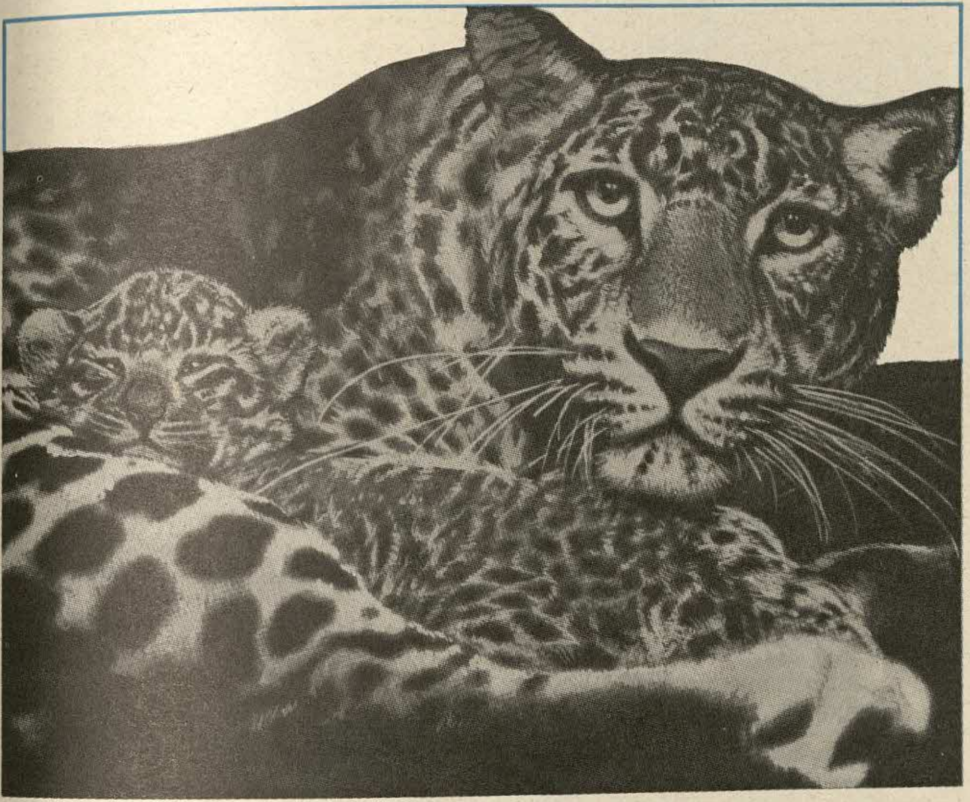
Leo IX. The issue of Papal vs. imperial powers was important during the rule of Leo IX, 1049 to 1054. Leo was active in correcting abuses within the Church and in insisting upon the power and rights of the Church.

Leo X, Pope from 1513 to 1521, saw the first great division in the ranks of Christianity when Luther organized the Reformation in Germany. At first he ignored the movement, but in 1521 proceeded to excommunicate Luther. The son of Lorenzo de' Medici, Pope Leo was a patron of the arts and learning and reorganized the University of Rome.

Leo XIII, Pope from 1878 to 1903, spent much of his time attempting to harmonize the diverse elements of the Church as well as to strengthen the activities of the Church in all lands. To this end, he re-established the Roman Catholic hierarchy in Scotland in 1878. Noted for his learning and statesmanship, Pope Leo did much to establish friendly relations between foreign nations and the Church and also organized the Catholic University in Washington, D. C. In 1891 he issued an encyclical championing the right of workers to organize unions and to improve their lot.

LEONARDO DA VINCI, *la o nahr'do dah veen'che.* See VINCI, LEONARDO DA.

LEON'IDAS. A king of Sparta, Leonidas was chosen to oppose Xerxes' invasion



THE TROPIC JUNGLE'S SPOTTED FURY
No animal is more vicious and completely beyond taming than the leopard.

of Greece in the fifth century B. C. Commanding a force of about 7,000 men, he ably defended the pass of Thermopylae during several assaults. Xerxes defeated Leonidas and his followers, however, after Ephialtes, a Greek, betrayed his countrymen by pointing out to the Persians a mountain path leading to the rear of the Greek forces (480 B. C.).

LEOPARD, *lep'urd*. It is said to require greater skill to see and kill a leopard than to kill a tiger. Leopards, found wild in the forested regions of Asia and Africa, are smaller than the other big cats. They capture their prey by lying in wait on the branches of trees over trails. Leopards can easily kill creatures as large as goats and dogs. They seize their victims by the throat and strangle them or break their spines by vicious bites.

Leopards are commonly caught in steel traps or in cage traps baited with living animals. They are killed for their skins and for the protection of domestic animals.

A leopard may reach a length of from six to eight feet, including the tail. The fur is yellow, with black spots arranged in groups. The spots on the head are smaller and more closely crowded. The underparts are almost white. The spots on the skins of leopards from Africa are smaller and more compactly crowded than on skins of leopards from Asia.

LEPIDOP'TERA. See INSECTS.

LETTUCE, *let'tis*. Valuable for its abundance of minerals and health-promoting vitamins, lettuce is an important salad vegetable. Though there are many varieties, the three most important are the *head*, *leaf*, and *Cos*, the last named being raised ex-

Courtesy U. S. Army Air Corps

WALLS AGAINST THE WATER

And men against the river. That's the story of the Mississippi levees; the earthen dikes whose occasional collapse means disaster.

tensively in Europe.

Head lettuce resembles a small cabbage and is usually preferred for salads because it is crisp and solid. Leaf lettuce, as the name indicates, has long, smooth leaves. If allowed to mature, lettuce will reach a height of over two feet and will bear pale-yellow flowers. Only the young plants are used as food. Lettuce is a member of the great composite family.

LEVANT′. The word *levant* is a general term referring to the region east of Italy as far as the Euphrates and the Nile. More specifically, it refers to the Asiatic coasts of the Mediterranean, and to Asia Minor. The name means, literally, *toward the sun.*

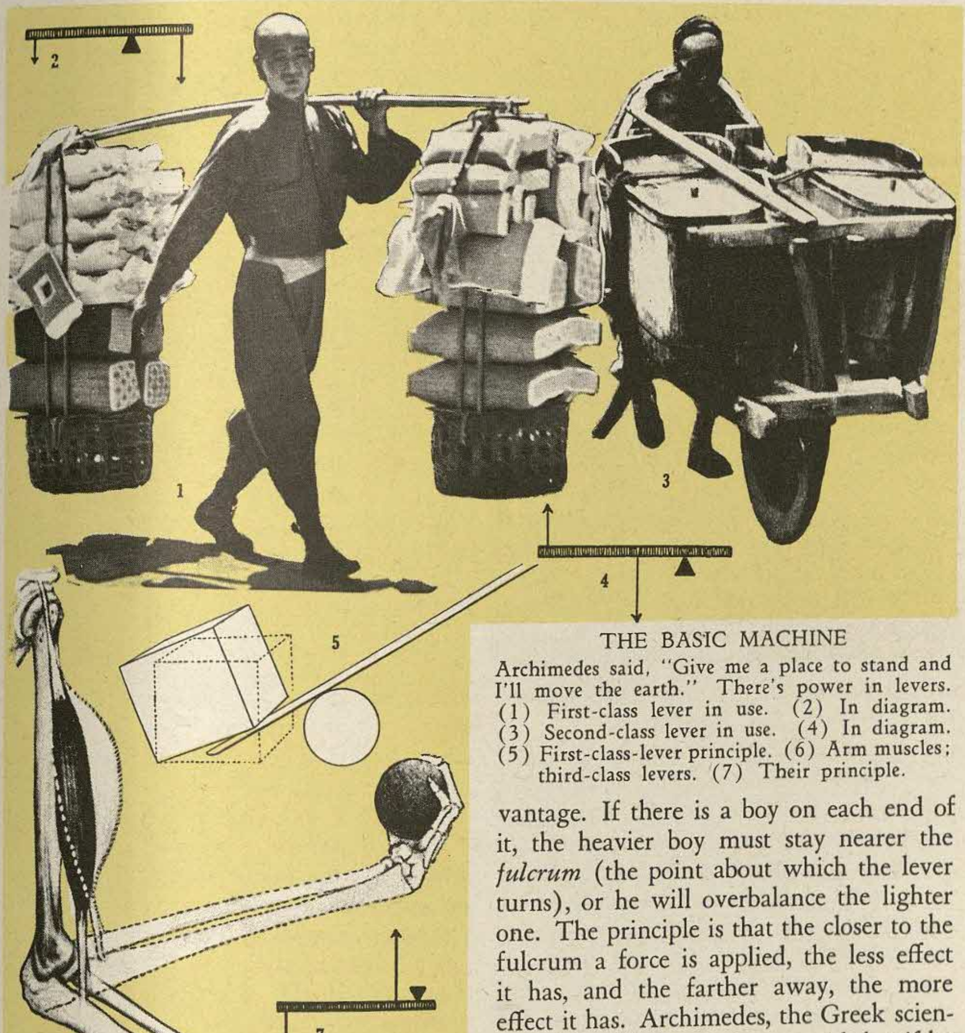
LEV′EE. In countries where the rivers frequently overflow their banks, flood the near-by farm land, and cause untold loss of life and property, levees are often built to hold the rivers in check. These levees are usually built of earth. They are broad at the bottom and narrower at the top and are often faced with concrete to prevent erosion. The top of the levee is frequently planted with trees or grass to help hold the soil.

Levees are usually built several feet back from the river to allow more channel for the stream during floods. During the worst flood periods, the tops of levees are piled high with sandbags to give additional strength and height. Moreover, they are often patrolled to keep burrowing animals from weakening them. In the United States, over 1,500 miles of levee have been built from the mouth of the Ohio to the mouth of the Mississippi, at a cost of millions of dollars. This work has been financed, for the most part, by the Federal government.

The most famous European levees are the great sea walls of Holland, known as dikes. Dikes are also found along the Po, Danube, and Vistula rivers. The Chinese have built a complicated levee system along the Hwang Ho. Yet, in spite of the precaution, this treacherous stream has sometimes broken through the embankments, drowning thousands of people and laying waste large areas of fertile farm land.

LEV′EL. Surveyors, engineers, carpenters, and machinists make frequent use of the level, an instrument for determining a level line or plane by means of a bubble tube. The tube is adjusted to a level line in the instrument and the position of the bubble marked. Thus, it follows that any time the bubble occupies this position, the line of the instrument is level.

One of the most common instruments is the carpenter's level, which is used in adjusting various members of a structure to a level or to a vertical position. In determining the difference of elevation or the extending of a level line for some distance, the bubble tube is combined with a line of sight, which may sometimes be combined with a telescope furnishing magnification. The vertical distances from the line of sight, so established, to other objects are measured by a level rod. See SURVEYING.



THE BASIC MACHINE

Archimedes said, "Give me a place to stand and I'll move the earth." There's power in levers. (1) First-class lever in use. (2) In diagram. (3) Second-class lever in use. (4) In diagram. (5) First-class-lever principle. (6) Arm muscles; third-class levers. (7) Their principle.

LEVER, *le'vur,* or *lev'ur.* In its simplest form the lever is a bar turning about an axle. The lever is a simple machine, used either to change direction of a force or to increase its effectiveness.

The seesaw is a lever which changes the direction of a force. If we bear down on one end of it, the other end is raised. The seesaw also illustrates the principle which makes the lever a machine to gain an advantage. If there is a boy on each end of it, the heavier boy must stay nearer the *fulcrum* (the point about which the lever turns), or he will overbalance the lighter one. The principle is that the closer to the fulcrum a force is applied, the less effect it has, and the farther away, the more effect it has. Archimedes, the Greek scientist of the third century B. C., said that if he had a lever long enough, and a place to rest it, he could move the world.

There are three classes of levers. Levers of the first class have the fulcrum between the weight and the power, as in the seesaw and the crowbar. Levers of the second class have the weight between the power and the fulcrum, as in the wheelbarrow and the nutcracker. Levers of the third class have the power between the weight and the fulcrum, as in the treadle of the sewing machine and in the forearm.

Leverage in Everyday Work. We can pull nails with a claw hammer, which is a lever, though we cannot pull them with our fingers. We can pull them best if we insert a block of wood under the hammer, for by so doing we bring the fulcrum closer to the nail. We can pry boards off a box with a chisel better than with a hatchet, for we apply our force farther from the fulcrum, which is the edge of the box. We cut metal with shears having longer handles than cloth shears, to get more leverage. These are but a few instances of the many ways in which the principle of the lever enters into everyday life.

LEVIT'ICUS. The Old Testament book containing the Hebrew laws of the priesthood and sacrifices is *Leviticus*. It also contains considerable history. The Greeks called it the "Levitical book," *Levitical* meaning *priestly*. The word is based on the name *Levi,* the priestly tribe of Israel.

LEWIS, JOHN LLEWELLYN (1880-). The son of Welsh immigrants, John L. Lewis came to the fore in the mid-1930's as a labor leader to be reckoned with in the American labor movement.

He was born in Lucas, Ia., in 1880, and at the age of twelve went to work in the mines. From 1909 to 1911 he was legislative representative at the Illinois state capital for the United Mine Workers of America union, a member of the American Federation of Labor. This was his first important labor-union post, and his success in Springfield led to his appointment in 1911 as labor organizer for the A. F. of L. He held the latter position until his election as vice-president of the United Mine Workers in 1917. Three years later he became president of the U. M. W.

In 1935, he organized the Committee for Industrial Organization, and as its chairman inaugurated the disruptive sitdown strikes in 1937. When the C. I. O. reorganized in 1938 as the Congress of Industrial Organizations, Lewis was made president; he resigned this post in 1940. In 1942, Lewis took the U.M.W. out of the C.I.O., in 1946 took it back into the A.F.of L., and in 1947 made it an independent union. See LABOR ORGANIZATIONS.

LEWIS, MERIWETHER (1774-1809). With William Clark, Meriwether Lewis gave America its first information concerning the vast territory included in the Louisiana Purchase. A native of Virginia, he served in the United States Army, taking part in the suppression of the Whisky Rebellion in 1794. When Thomas Jefferson became President, he appointed Lewis his private secretary, and two years later gave him command of an expedition into the new territory. Lewis was granted 1,500 acres of land when he returned and, in 1807, became governor of Louisiana Territory.

LEWIS, SINCLAIR (1885-1951). One of the most significant American authors of the twentieth century, Sinclair Lewis gained great fame at home and abroad for his critical examinations of American life and American character.

He was born in Sauk Center, Minn., the son of a small-town doctor. After his graduation from Yale University in 1907, he was for a while associated with Upton Sinclair's socialist colony Helicon Hall, in New Jersey. Then followed several years of reporting and editing before he began, in 1916, to devote his entire time to writing.

Recognition did not come to him, however, until the publication of *Main Street* in 1920. This novel, a satire on small-town life, was immensely popular. It was followed two years later by *Babbitt* in which he satirized the middle-class American business man. For *Arrowsmith,* which appeared in 1925, Lewis was awarded the Pulitzer Prize, but he refused the award.

He wrote also the novels *Elmer Gantry, Dodsworth, It Can't Happen Here, Gideon Planish*. and *Cass Timberlaine*. He received the Nobel Prize in literature in 1930, the first American to win this award.

LEWIS AND CLARK EXPEDITION. Wishing to know what kind of land made up the vast territory acquired from France by the Louisiana Purchase, President Thomas Jefferson sent Meriwether Lewis and William Clark with an expedition through the area in 1804.

Starting from Saint Louis, May 14, 1804,

The Travelers Insurance Co.

INDIAN BIRD WOMAN SACAGAWEA, GUIDE TO THE PACIFIC NORTHWEST
But for her aid, and help from the Shoshones, Lewis and Clark might have died in the Rockies.

the group followed the Missouri River, reaching the Mandan Indian country in the winter of 1804-05. The next spring Lewis and Clark pushed on and, with the aid of Sacagawea, an Indian woman, crossed the Rocky Mountains without trouble from the Indians. Finding the Columbia River, the party followed it and reached the Pacific coast in November, 1805. In March, 1806, they began the return trip and were back in Saint Louis in September.

The expedition, which traveled about 8,500 miles, secured considerable information and gave the United States its claim to the Oregon country. The expedition was commemorated in 1905 with an exposition at Portland, Ore.

LEXINGTON, Battle of. On April 19, 1775, seventy determined New England farmers defied a force of 800 British soldiers at Lexington, Mass.; and when the brief battle was over, the struggle for independence was a reality. The night before, Paul Revere had ridden from Charlestown to the little Middlesex village, eleven miles northwest of Boston, and the militiamen gathered at Lexington and Concord to resist the English, who hoped to seize Samuel Adams and John Hancock.

The British won the first battle of this war, killing eight Americans and wounding ten. But they were repulsed at Concord, where they met 400 more grim farmers; and, on their retreat to Boston, they were harassed by snipers hiding behind trees and rocks. Altogether the British lost 273 men killed or wounded; the Americans, ninety-three. See Revere, Paul; Revolutionary War in America.

LIB'ERAL. Persons who believe that political freedom for the people is fundamentally necessary for economic, religious, and social freedom are known as liberals. They stand for reform in government and progressive policies designed to bring about greater freedom for the great mass of people; and they oppose all attempts to impair this freedom. They also are in opposition to the maintenance of the *status quo* (the position held by conservatives) and the revolutionary policies of radicals.

In England and Canada the Liberal party is a political organization advocating liberalism in government. In the United States there is no political party composed entirely of liberals, although several times "third" parties have been formed by liberal dissenters within the Democratic and Republican ranks.

Liberalism is usually in advance of the times, and liberal policies eventually are adopted by governments unless there is a reactionary or revolutionary swing. Liberals advocated the abolition of serfdom, slavery, and autocratic religious authority and the adoption of universal suffrage long before such reforms were a reality.

LIBERAL REPUBLICAN PARTY. See POLITICAL PARTIES IN THE UNITED STATES.

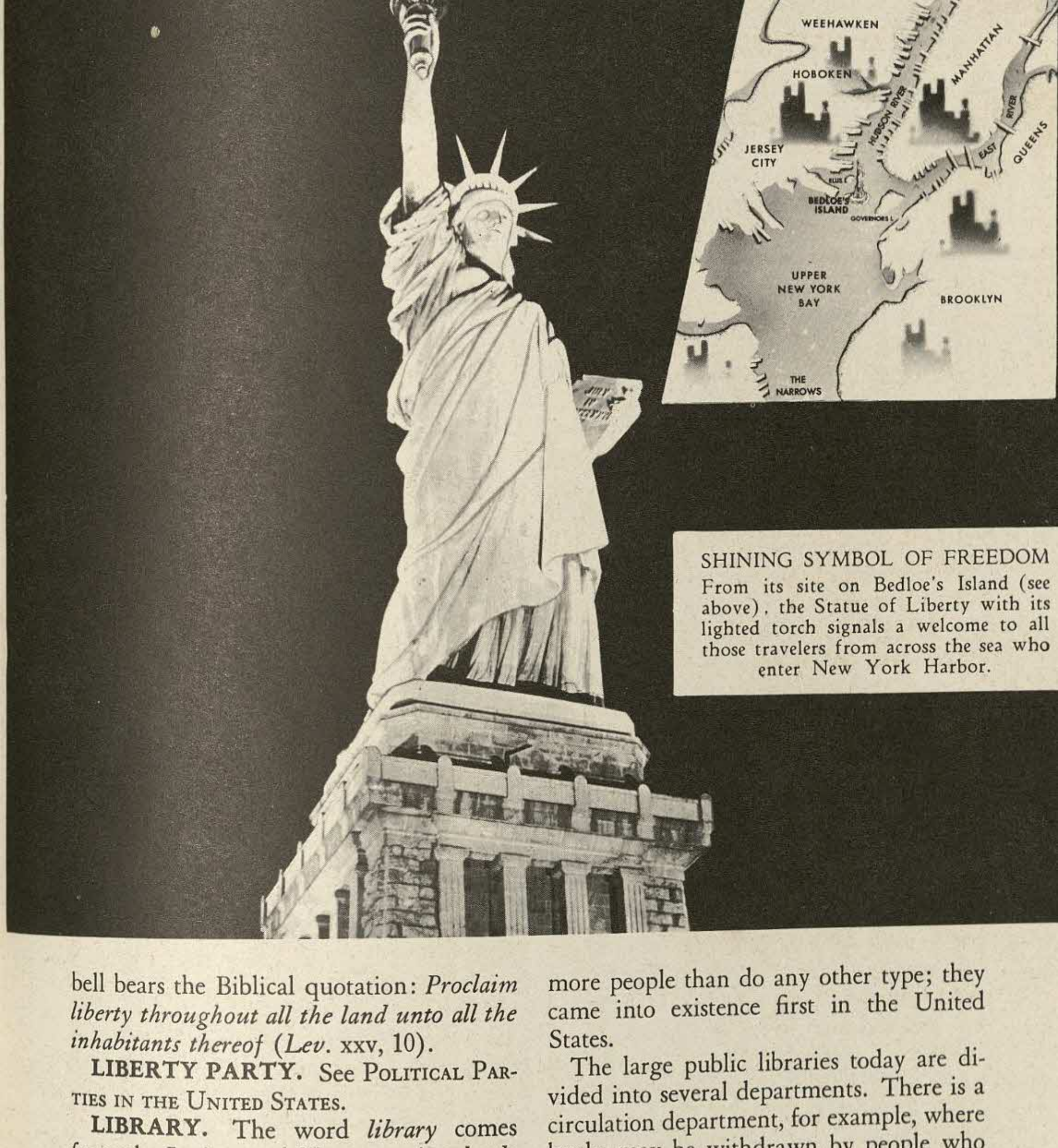
LIBE′RIA. Africa's oldest independent nation is the Republic of Liberia, the result of a remarkable experiment in resettlement of population. Liberia lies on the southern edge of Africa's huge westerly projection and has an area of 43,000 square miles. Its population, entirely Negro, is about 2,750,000. Of these, only about 60,000 are civilized; and, though they govern the land, they make little effort to dominate the tribes of the interior.

Liberia was founded in 1822 because of the efforts of a group of Americans who wished to provide a home for freed slaves; and its capital city, Monrovia, is named after President Monroe. In 1847 the republic was established according to the American model. About 20,000 American Negroes live in Liberia. Its coastal population has flourished, but very little has been done toward developing what appears to be an extremely fertile and productive region. Liberian products include forest fibers, palm kernels and oil, wild rubber, raw gold, rice, cassava, coffee, sugar cane, and cotton. Most important, however, are the rubber grown on the huge plantation operated by an American firm and the iron ore mined by another American company. In 1951 Liberia's first railroad was opened between the iron mine and Monrovia, the capital and chief port. Ships and planes provide connection with the outside world.

LIBERTY, STATUE OF. The first sight which greets the ocean traveler arriving in New York from abroad is the Statue of Liberty, a huge bronze figure on Bedloe's Island in New York Harbor. It is a symbol of American freedom and was presented to the United States by France in 1884 as a memorial to the hundredth anniversary of American independence. It was unveiled in 1886. The figure was designed by Frédéric Bartholdi, a French sculptor, and was named *Liberty Enlightening the World.* The cost of the statue was defrayed by popular subscription.

The largest statue in the world, Liberty is shown as a woman holding aloft a gigantic torch. The figure itself is 151 feet high; the height from the base to the top of the torch is 305 feet. Elevators and stairways extend through the statue from the base to the head. The hand of the statue is sixteen feet long, with an eight-foot index finger and a fingernail which measures thirteen by ten inches. On October 28, 1936, the fiftieth anniversary of the dedication of the statue was commemorated.

LIBERTY BELL. Hanging originally in Independence Hall, Philadelphia, the historic Liberty Bell rang forth the signal of America's freedom when the Declaration of Independence was adopted on July 4, 1776. Cast in England in 1752, the bell cracked at its first ringing, was recast in 1753, and again cracked while being tolled for the funeral of Chief Justice John Marshall, July 8, 1835. It was later taken down and placed on exhibition, and may be seen today in Independence Hall. The



SHINING SYMBOL OF FREEDOM
From its site on Bedloe's Island (see above), the Statue of Liberty with its lighted torch signals a welcome to all those travelers from across the sea who enter New York Harbor.

bell bears the Biblical quotation: *Proclaim liberty throughout all the land unto all the inhabitants thereof* (*Lev.* xxv, 10).

LIBERTY PARTY. See POLITICAL PARTIES IN THE UNITED STATES.

LIBRARY. The word *library* comes from the Latin word *liber,* meaning *book*. The word is used to refer to a collection of books and also to a building which has as its chief purpose the housing of such a collection. A library may be a collection of only a small number of books in one's own home, or it may be a great institution with millions of books, pamphlets, and other items. There are national, state, county, township, and school libraries, as well as endowed libraries with collections of books pertaining to special fields. But the tax-supported free public libraries help more people than do any other type; they came into existence first in the United States.

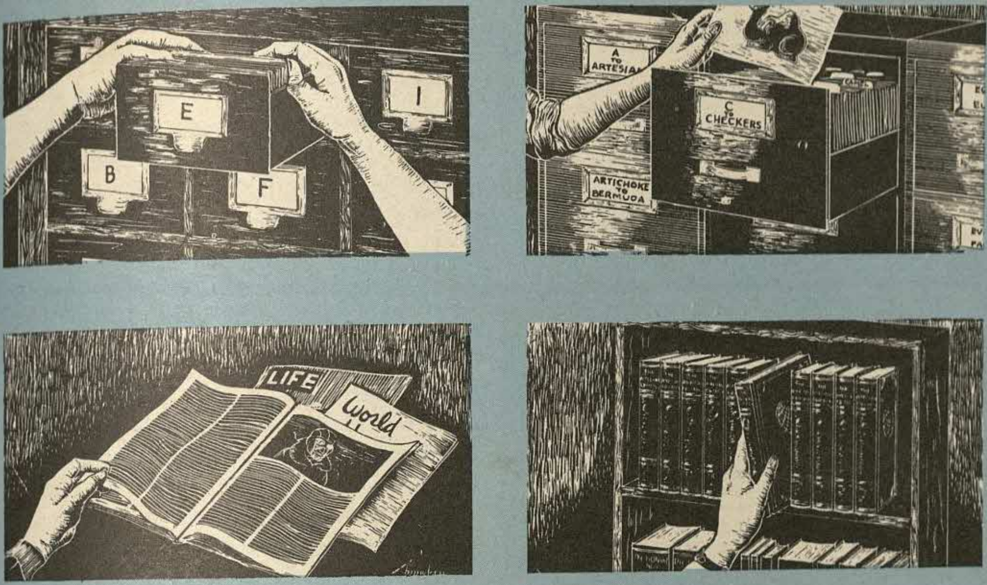
The large public libraries today are divided into several departments. There is a circulation department, for example, where books may be withdrawn by people who hold library cards. Sometimes this department has an open-shelf division where library patrons select their books themselves. But not all the books are thus available. To secure books not on the open shelves, the reader must consult the classified catalogues, note the number of the book he desires, and have a library attendant secure the book for him.

The reference room is an important part of the library. Here are kept books which may not be withdrawn but must be con-

John Hancock Mutual Life Insurance Company

YOUNG AND OLD DRAW CHECKS ON THE "BANK OF BOOKS"

A public library is a part of the world's great treasury—containing not gold but things infinitely more precious: knowledge, adventure, humor, romance, and the example of heroic men and women. A person who grows up with books has a good start toward becoming an informed citizen—one who uses his community resources to learn, to know, and to remain free.



FOUR AIDS TO INFORMATION IN THE LIBRARY
The card catalog for book titles, the *Readers' Guide* for magazine references, the vertical file for pamphlets and pictures, reference books for all sorts of information.

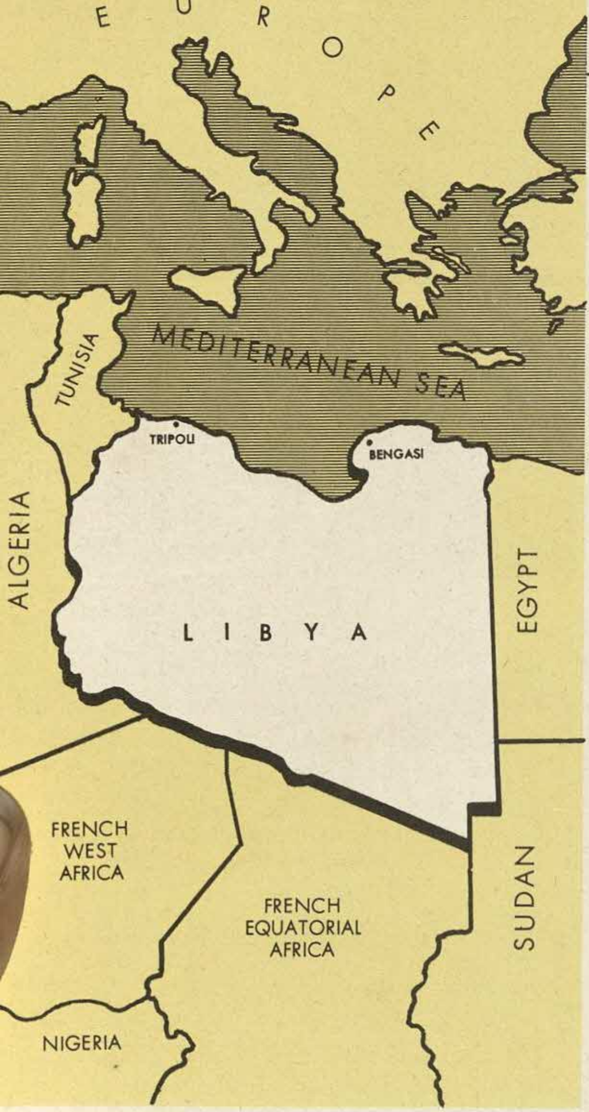
sulted in the library. A reading room is provided where people may sit and read books as well as magazines and newspapers. Other special departments in large libraries include a children's room, a civics room, a music department, and others. Sometimes a large library also maintains branches in various parts of the city.

Library work today is a profession. Librarians have special training just as teachers do. They may, for instance, be specialists who take charge of reference rooms where people consult encyclopedias and study special subjects, or they may be children's librarians who understand how to make libraries interesting and helpful to boys and girls.

Some of the world's famous libraries are the national library of France, the Bibliothèque, at Paris; the library of the British Museum; the State Library of the Soviet Union at Leningrad; the Henry C. Folger Library, at Washington, D. C.; the Newberry and John Crerar libraries, at Chicago; and the Library of Congress, at Washington, D. C.

LIBRARY OF CONGRESS. The Library of Congress had its beginning in April, 1800, when Congress voted $5,000 for the purchase of books for the use of the Senate and the House of Representatives. This library was housed in a room in the Capitol. The first collection was destroyed in 1814 when the British burned Washington. Jefferson's personal library of about 7,000 volumes was purchased to start the library once more, but most of the second collection was destroyed by fire in 1851. After the copyright law was passed, the collection of books increased rapidly because the law states that two copies of each book copyrighted shall be placed in the Congressional Library. At last, in 1897, a special building was completed just east of the Capitol, and in 1939 an annex was erected.

The library contains millions of items, including books, pamphlets, manuscripts, newspapers, maps, engravings, musical compositions, wire recordings, and movie reels, as well as volumes in raised type and "talking book" records for the blind. Its collections of incunabula (books printed before 1500) and of books on aeronautical subjects are the world's finest. Although its primary purpose is to assist Congressmen, the library also serves all other government employees and the general public.



LIBYA, *lib'ih uh.* Called "an Egypt without a Nile," this thirsty North African country is poor and backward. Although it covers about 680,000 square miles, it has only about 1,092,000 people, mostly Moslem Arabs. Since it is a desert or near-desert, broken by only a few oases, most of its population, and its few cities and farms are in the two small fertile areas along the Mediterranean.

The herding of cattle, sheep, goats, camels, donkeys, and horses by wandering or semisettled tribesmen is the leading occupation. Other products include dates gathered on the inland oases, papermaking esparto grass from the subdesert, and wheat, barley, olives, grapes, dates, citrus fruits, almonds, and figs grown along the coast. Still others include the sponges and tuna taken offshore and such handiwork as matting, woven carpets and blankets, fabrics embroidered with gold and silver, metalwares, and leather articles. Libya has no known minerals, no forests, and no permanent streams.

After taking Libya from Turkey in 1911, Italy sent thousands of settlers there, built a few short rail lines, and constructed motor roads. One of these links Tripoli, the largest city and port, with neighboring Tunisia on the west and Egypt on the east. Although other roads lead out to the oases, camel caravan is still the chief means of transportation.

The Allies won control of Libya in World War II, and in 1951 it became the first nation to secure its independence under United Nations sponsorship. It is now a federated, constitutional monarchy, composed of three provinces. Tripoli and Bengasi are twin capitals. Libya is a member of the Arab League. See ARAB LEAGUE; ITALY; OASIS.

LICHENS, *li'kenz.* In places where there are large boulders strewn about the earth, many of them are encrusted with greenish, mossy growths known as lichens. Lichens are a combination of fungi and algae growing together. These two can live together where neither can survive alone.

Lichens have neither stems nor leaves, but are made up of a leaflike thallus which takes nourishment from the air. There are about 4,000 species, gray, yellow, or brown in color and often beautiful in appearance. Some lichens grow on the bark of trees; the rock lichens perform a valuable function in helping to crumble the rocks on which they live, turning it into soil. In Iceland, lichens are valuable as food; in the far north they are found growing under the snow and form the principal forage of reindeer. The decaying bodies of these plants often mix with the poor soil, forming a richer ground in which crops may be grown.

LICORICE, or LIQUORICE, *lik'o ris.* A native of Southern Europe, the licorice plant is a member of the leguminous (pod-bearing) family. There is practically no cultivation of the plant in America.

The plant bears large, purple flowers, but it is the juice from the small, yellowish roots that is used to flavor certain tobacco products, such as plug tobacco; also candy, chewing gum, cough drops, soft drinks, and drugs. About five times as sweet as cane sugar, licorice is sometimes made into black, gummy sticks of candy. It also has some medicinal value.

LICTORS, *lik' torz.* The attendants who formed the guard of honor of chief magistrates and officials of ancient Rome were called lictors. They were usually freedmen, and their duty was to clear the way for their master. Their number was determined by the importance of the official, from two for a praetor to twenty-four for a dictator. As their badge of office, the lictors carried *fasces*, or axes tied within a bundle of sticks. See FASCISM.

LIECHTENSTEIN, *leek' ten stine.* One of the smallest independent states in the world is the Principality of Liechtenstein, with an area of sixty-five square miles. It is between Switzerland and Austria, on the Rhine's east bank. Mountainous except in the west, its green valleys have fertile soil, and the chief occupations are agriculture and stock raising. Weaving, winemaking, and woodcarving are also important. There are over 13,500 people in the country, most of whom are of German origin and Catholic faith.

LIEUTENANT, *lu ten'ant.* See RANK.

LIEUTENANT GENERAL. See RANK.

LIFE, LENGTH OF. See LONGEVITY; MORTALITY, LAW OF.

LIFE INSURANCE. See INSURANCE.

LIFE'SAVING SERVICE. Saving human life endangered at sea by wrecks, accidents, or sickness has long been the concern of nations. To aid in carrying out this humane work, the principal maritime nations of the world have organized rescue groups, stationed along the coasts at danger points. Such organizations have been of immeasurable value in saving human life and have also been important factors in preventing accidents.

Douglas Aircraft Co.

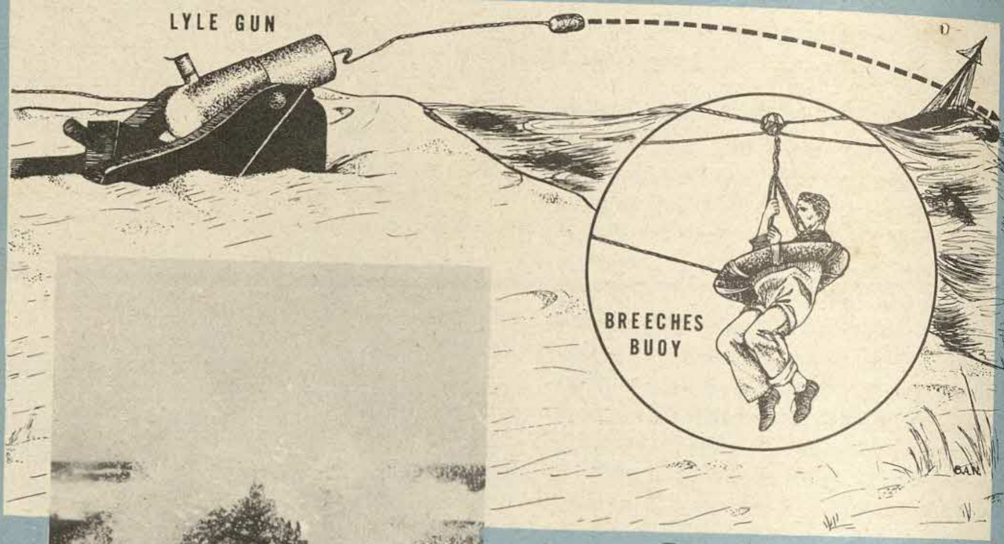
LIFESAVING BY AIR

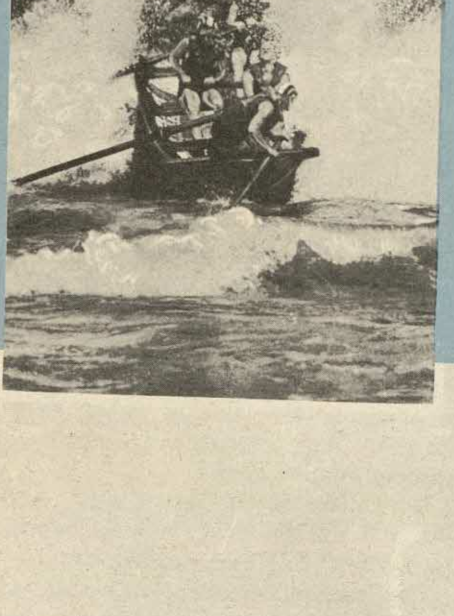
U.S. Air Force plane drops life raft to help survivors of shipwreck. Rescue plane carries four raft kits capable of saving 160 people.

The United States Coast Guard. In the United States, lifesaving is in the hands of the Coast Guard (see COAST GUARD).

The English Service. With about 275 stations at important points along the English coast, the British lifesaving service is under the direction of the Royal National Lifeboat Institution, founded in 1824. This organization is not controlled by the government but is supported by popular subscription. It spends more than three quarters of a million dollars annually in the saving of life at sea.

The Service in Other Countries. The Lifesaving Service in Canada was organized in 1880 and now includes many stations operated under the direction of the government. The French service, which is a volunteer service, was organized in





Australian News & Information Bureau; U. S. Coast Guard

RESCUE AT SEA

Once a lifeline has been shot to a vessel in distress, the passengers can often be brought ashore by breeches buoy (above). Launching a lifeboat in a heavy surf requires strength, skill, and courage; at left, an Australian crew smashes through heavy breakers on its way from the beach to the open sea. One of the modern aids to lifesaving is the helicopter. The 'copter below, taking off from the sea, demonstrates how a disaster victim can be carried in a litter firmly attached to the craft beside the cabin.

1865 and is much like the British. A similar organization in Germany, also founded in 1865, maintains nearly a hundred stations in the Baltic and North seas. Belgium's service was begun in 1838 and has always been under the complete charge of the government. Italy has a general volunteer service made up of many local groups. In Denmark the organization was founded by the government in 1852. Japanese organizations are private, but have received government aid since their beginning in 1889.

Equipment of Lifesaving Stations. There are certain general features of the lifesaving service which are common to all such organizations. Certain standard devices are used by lifesaving crews all over the world.

Lifeboats. The most important equipment in lifesaving is a sturdily constructed boat which will withstand the pounding of heavy seas. The first lifeboat was patented in England in 1785, but an improved form was invented a few years later and remained in use until 1851. Since that time, lifeboats have been the subject of much improvement, until reaching their present state of efficiency. Boats can now carry quite heavy loads, and it is almost impossible to overturn them. Each boat carries provisions for emergency cases and is provided with life preservers. Modern lifeboats are so constructed that water entering them will be discharged, and many of them are powered by motors.

Life Preservers. One of the most important of all lifesaving aids is the life preserver or buoy, which is a canvas-covered cork or kapok ring capable of supporting the weight of a person in the water. The preserver has loops of rope around the rim so that it can be attached to a lifeline. Another type of life preserver is the cork jacket which is fastened about the body. It serves the same purpose as the ring preserver.

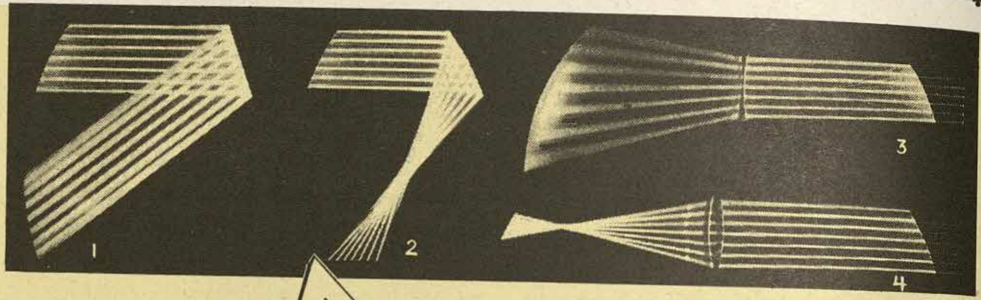
Lifesaving Gun and Rocket. Among the standard items found in all lifesaving stations are the gun and rocket. The gun consists of a mortar containing a barbed harpoon-like projectile to which is attached a light rope. By shooting this projectile into the rigging of the distressed ship, the rescuers can establish a line between the two ships. This gun can be fired with accuracy at distances of 700 to 1,000 yards. The rocket is a variation of this device, and also is used as a means of casting a lifeline to a distressed ship. When a lifeline has been established between the two ships, a breeches buoy is used to remove the passengers. It is a heavy, trouser-like affair attached to a roller which slides along the lifeline. By this means passengers are frequently removed from grounded ships.

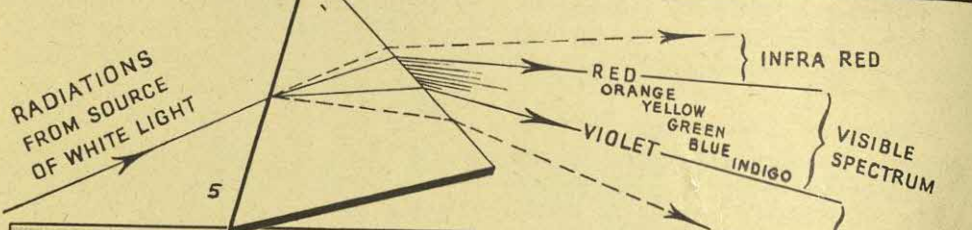
Other Equipment. All the equipment discussed above is more or less standard in all stations. Other types are not so frequently found. Included in the latter group is the flying boat, used to move sick passengers from ship to shore. The efficiency of these flying ambulances has been particularly demonstrated in rescues made from outlying fishing vessels.

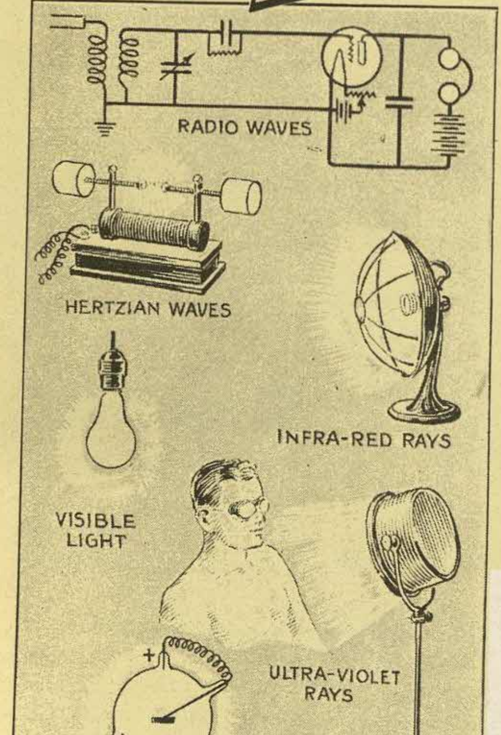
A seaman slides to safety in a breeches buoy.
U.S. Coast Guard Official Photo

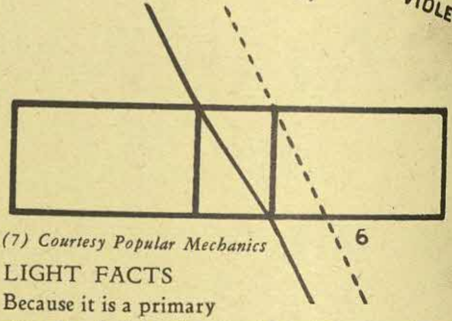
LIG'AMENT. Surrounding the joints in the body's bony structure are tough, fibrous, whitish or yellowish tissues known as ligaments. They serve to connect bones and keep them in place, join muscles to them, and in some cases keep several organs together. Being stronger than tendons, they are not so likely to be torn.

Some ligaments, such as those in the knee, are cordlike; others are flattened bands, as in the elbow. The shoulder and hip joints are surrounded by capsular ligaments. When dislocations occur, these ligaments are often broken. If ligaments are overstretched, they never regain their full elasticity; some impairment of the activity of the joint always follows.









(7) Courtesy Popular Mechanics

LIGHT FACTS

Because it is a primary necessity, light's behavior is of the utmost importance to man.. (1 and 2) Reflection from a flat and a concave mirror. (3 and 4) Refraction: light bends toward a perpendicular to the surface of a denser medium. (5) How a prism takes a beam apart. (6) Rays of light passing through a windowpane are refracted twice and so appear straight. (7) All these produce some form of electromagnetic rays.

LIGHT, *lite.* The reflection of light from the surface of an object enables us to see the object. Our eye is a camera-like arrangement which does not see an object directly, but rather catches the reflection of light from such objects and projects an image on the retina; then the impression is communicated to the brain. Thus we see objects by means of light, but light itself is something of a mystery. Many theories have been advanced as to the nature of light, which has fascinated and puzzled scientists for many centuries.

What Is Light? One of the earliest

theories about the nature of light was the *corpuscular* theory of Sir Isaac Newton, published in 1704. Newton thought that light was made up of corpuscles, or tiny particles, which were shot out into space from a bright object. However, this theory did not satisfactorily explain many of the ways in which light acts, and a century later it was replaced by the *wave* theory. This hypothesis was first advanced by the Dutch scientist Huygens, about 1678, and was first presented in detail in 1802 by the English physicist, Thomas Young.

According to the wave theory, light is a form of radiant energy whose vibrations travel in waves from light-giving bodies, such as the sun and stars, electric lamps, candles, and all other luminous objects, whether natural or artificial sources of light. Scientists have assumed that all space is filled with an elastic medium called the *ether*, for it has seemed reasonable to suppose that light must have some sort of a medium through which to travel. This medium cannot be the air, for light travels through a vacuum and also from the far-off depths of space where there is no atmosphere. The existence of the ether has never been proved, and the term is retained largely as a matter of convenience.

The wave theory was further expanded, later in the nineteenth century, by James Clerk Maxwell, who showed that the waves of light are electromagnetic waves. The vibrations, or oscillations, of light are perpendicular to the direction in which the waves travel. That is, light is a form of electromagnetic radiation which is transmitted in transverse waves through an assumed ether.

More recent experiments seem to show that light exhibits certain properties of particles as well as properties of waves of energy. That is, a modified corpuscular theory is receiving consideration. At some future date scientists may be able to reconcile the two ideas.

Properties of Light Waves. Light waves travel at a uniform velocity of about 186,300 miles a second in space, but the vibrations vary in speed, and the waves in length. The waves that affect the retina of the eye—so-called visible light—form one section, or *octave*, of a great scale of electromagnetic radiations, of different wave lengths. Ordinary sunlight is a combination of seven colors—violet, indigo, blue, green, yellow, orange, and red. When a beam of light is passed through a prism, it will be broken into these seven colors of the solar spectrum, just as raindrops, acting as prisms, cause the arch of the rainbow to be pictured on the sky.

The longest waves of visible light are those seen as red, and the shortest are the violet. Beyond the violet end of the scale are the ultra-violet rays, which are invisible to our eyes. Shorter than ultra-violet rays are X-rays and gamma rays. Cosmic rays, once regarded as the shortest of all electromagnetic radiations, are now thought to be electrically charged particles. Longer than the red rays of visible light are the infra-red, or heat rays, and longer still than these are radio waves. The shortest waves have the highest frequency of vibrations, for the speed of the oscillations varies inversely with the length of the waves.

Light as Illumination. Luminous bodies give off light uniformly in all directions. The modern scientific study of illumination in the home, school, and factory makes use of two important laws of intensity: the brightness of light varies directly with the brightness of the luminous object, and the brightness of light decreases as the square of the distance from the luminous object increases. For example, a light two feet away from the eyes will give four times as much illumination as a light four feet away.

Because light rays travel in straight lines through a medium of uniform density, it is possible to cut off the light from a lamp by placing a screen in front of it. The rays may be reflected or absorbed, but they will not travel around the screen.

Reflection of Light. When light strikes an object, some of the rays are absorbed by the object, while others are reflected.

Interchemical Corporation

A WARNING FINGER

The shaft of light from the lighthouse warns mariners of dangers to navigation.

This fact is illustrated by a pane of glass. We know that it absorbs some light rays because it grows hot in the sun, and we also know that it reflects light because of the way it flashes in the sun. A smooth surface such as this will reflect light in a few directions only, but a rough surface will reflect light rays in thousands of directions, making such objects easier to see.

Just as a ball thrown against a wall will bounce off at an angle equal to the angle at which it struck, so light rays will bounce

ASSISTANCE
Lightships are less permanent types of lighthouses. With signal lights fixed to tall masts, they anchor near danger spots to warn navigators of dangerous rocky coasts and shoals.

off hard plane surfaces in the same way; in other words the *angle of incidence* is equal to the *angle of reflection.*

Refraction of Light. When a ray of light passes from the air into a piece of glass, it travels from a light medium to a heavier one, and the ray is bent because the speed of light varies for different media. Such bending is called *refraction.* When the ray enters the glass it is slowed up; but as the ray travels through the glass, the side which first touched the glass will be moving at a slightly higher speed. Thus, the ray is bent in the direction of a line perpendicular to the surface of the heavier body. As the ray leaves the object, the reverse occurs and the light ray is bent again, but this time away from the perpendicular. Rays of light which are bent when passing through an ordinary piece of flat glass are refracted twice and continue in the same general direction after leaving the glass.

Consult the following articles for further information:

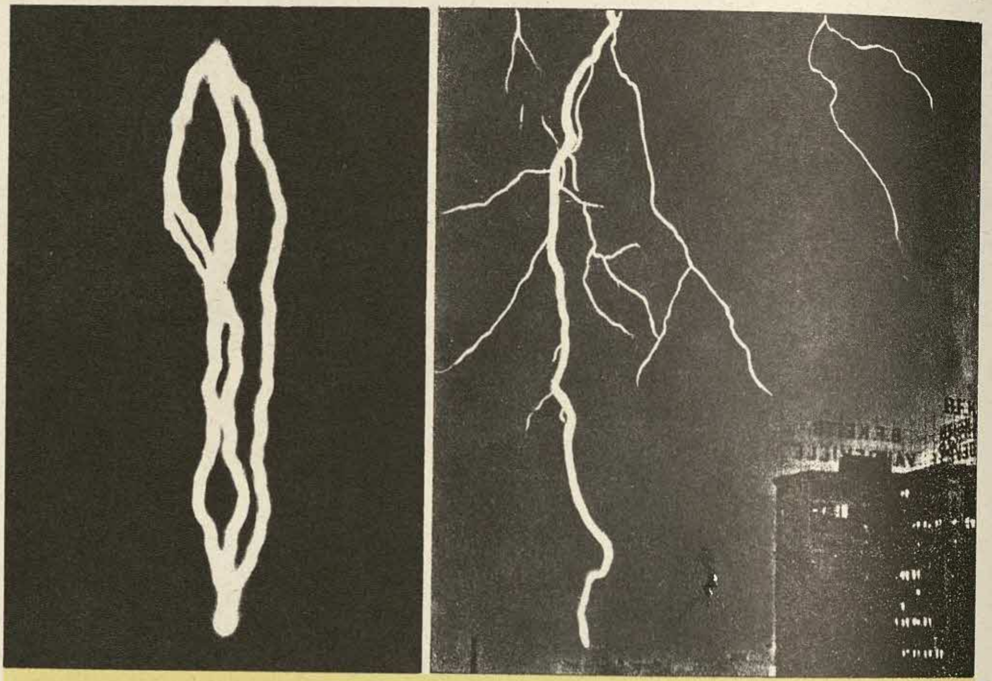
Actinism
Camera
Color
Electromagnetic Theory
Ether
Illumination
Lens
Microscope
Mirror
Polarization of Light
Prism
Rainbow
Spectroscope
Telescope

LIGHT'HOUSE. Dangers to mariners include islands, reefs, and points of land. Lighthouses are aids to navigation, used to mark these obstructions permanently. In daylight the lighthouse is a marker; at night its light is visible. Lighthouses usually have horns or whistles to signal in foggy weather. Some have electronic equipment to broadcast signals to ships with radio receivers.

Each lighthouse has its own special appearance and signals for identification. These are listed in publications for navigators. The lights may be *fixed* (steady), *flashing,* or *occulting* (going on and off). They may be either white, red, or green. Many color combinations and duration of the lights are thus possible so that each light in a general area can be identified easily by the navigator.

The candle power of a light partially determines how far a light is seen. A bright light is visible for a longer distance than a weak one. But, because of the curvature of the earth, even a bright light must be placed high above the water for visibility at a distance. A bright light, fifty feet above water, can be seen for about nine miles. Today most of the lamps in the larger lighthouses are electric; others usually burn acetylene gas. Some have permanent lighthouse keepers; others operate automatically.

Lightships are also used as warning sig-



ELECTRIC SPARKS IN THE GRAND MANNER

When a charge of sufficient intensity is established in the clouds, it leaps groundward in the form of lightning (right). Similar displays can be made in laboratories (left).

nals. Anchored near dangerous spots, they have signal lights fixed to high masts.

Lighthouses of the United States are managed by the U. S. Coast Guard, which maintains altogether more than 39,000 aids to navigation. See Buoy.

LIGHT'NING. With a blinding flash of light and a terrific crash, Nature unleashes one of her greatest forces—lightning, a surge of electricity that dwarfs man's best efforts at imitation. For, as Franklin discovered in the eighteenth century, lightning and electricity are one and the same thing. Whenever two clouds or a cloud and the earth, carrying opposite charges, come close together, a long flash of electrical sparks will stream between the two.

Lightning almost invariably accompanies a torrential downpour of rain. In this case the raindrops, while falling, split apart; the small fragments are carried skyward by the upward wind, and the larger particles stay in the lower part of the cloud or fall to earth. The repeated accumulation of negatively charged droplets in the upper part of the cloud, and of positively charged drops in the lower part, results in such a difference of potential as to cause a great spark discharge—lightning.

There are three principal forms of lightning—*heat* or *sheet, chain* or *zigzag,* and *ball.* Heat lightning takes the form of a bright sheet of flame in the sky, and is really nothing but the reflection of chain lightning which is, itself, invisible to the observer. Chain lightning is a line of jagged, brilliant streaks that leap across the sky during a storm. Ball lightning is a peculiar type that scientists cannot explain. It appears as balls of fire falling from the clouds to the earth. These explode as soon as they strike the ground.

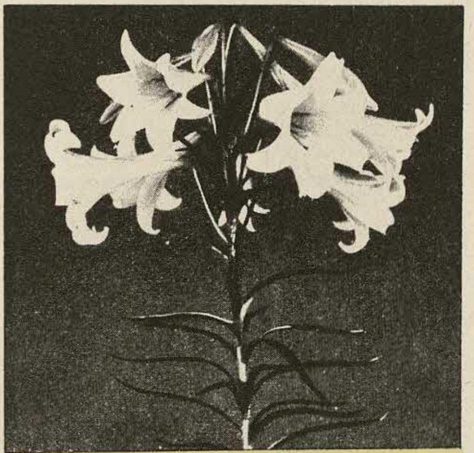
As the lightning flash forces its way through the atmosphere, the sudden heating of the air along its course causes the air to expand, the cooler air at a distance being violently compressed. The loud crash or long, deep-toned roar that accompanies this process is the thunder. Light travels approximately 186,300 miles a second, sound but 1,100 feet a second. Therefore one may see the flash of lightning several seconds before one hears the thunder. If this interval is timed, an observer is able to determine how far away the lightning is. See LIGHTNING ROD.

LIGHTNING ROD. To protect buildings from being set on fire by lightning, Benjamin Franklin invented the lightning rod in 1752. The device has been modified since Franklin's time, and is now seen chiefly in rural districts. The wide use of steel and other metals in city buildings makes lightning rods unnecessary in metropolitan areas. The modern lightning rod is a metal tube, four or five feet tall, terminating in one or more sharp points. The rods are placed on prominent parts of roofs, and are connected with one another, with metal parts of the structure, and with the earth by iron or copper cables. Electricity accumulating on roofs is discharged by the sharp points on the rods, or lightning bolts are carried harmlessly to the ground by the metal conductors.

LIGHTSHIP. See LIGHTHOUSE.

LIG'NITE. Intermediate between peat and soft coal, lignite is brownish coal in which the woody form is still visible and which contains a much higher water content than true coal. Lignite occurs in great abundance in some of the Northwestern states and in the Canadian provinces of Alberta, British Columbia, and Saskatchewan. In North Dakota lignite is the most important fuel in general use. See COAL.

LI'LAC. A member of the olive family, the lilac is common in America. It bears lovely clusters of single or double-flowered blue, white, or purple flowers. The fragrant blossoms are often used for perfumes and toilet waters. Lilacs may reach a height of twelve or fifteen feet. They are natives of Northern Persia, from whence they spread to Europe and the Western Hemisphere.



EASTERTIDE LOVELINESS

LILY. Producing lovely, colorful flowers, the lily grows from a bulb. Most lilies have tubular, recurving, or bell-shaped floral envelopes divided into six parts. The plants are easily raised, common in leaf-mold soil, and a great favorite with the gardeners. The calla lily and water lily are misnamed, since they do not belong to the lily family.

Best known among the lilies is the white *Easter* lily, an emblem of purity and innocence. Other outstanding lilies are the *Madonna, gold-banded, regal, Turk's-cap, orange, tiger, Mediterranean,* and several beautiful Chinese and Japanese varieties.

LIME. Looking remarkably like a small, green lemon, the lime, a member of the citrus family, is a favorite summer-beverage fruit. It was originally grown in China and India, later spreading to Europe, the West Indies, Mexico, and South America. In the United States, its growth is chiefly confined to the Florida Keys.

Lime trees are planted about fifteen feet apart and reach a height of eight feet. They are harvested and used when still green. The juice of the lime is used in making limeade and in the preparation of citric acid.

LIME. Chemically known as *calcium oxide,* lime, or *quicklime,* is manufactured by heating limestone in kilns. It is a white powder with the caustic properties of lye, partially dissolved in water, and is not easily affected by heat. In the manufacturing process, limestone is emptied into the top of the kiln, and the quicklime taken out at the bottom. Although the product is an impure form, it is generally used for commercial purposes.

The finest lime is obtained from marble. *Slaked* lime is a fine, white powder resulting from mixing lime and water, a process that is accompanied by considerable heat. *Hydraulic* lime, which will harden under water, is made by burning limestone which contains quantities of silica and clay.

Lime is used in the making of glass, cement, whitewash, mortar, bleaching powder, and soap, and in removing hair from skins in tanning. It is also used on the farm for overcoming acid soil, to stimulate the action of soil bacteria, and to give the soil a better texture.

LIME'STONE. Found in nature as rock, composed of calcium or magnesium, oxygen, and carbon, limestone is a coarse-grained mineral of wide use and distribution. It is usually gray in color, but because of impurities certain varieties range from white to black. Pure limestone forms in crystals, which from their shape are often called *dog-tooth* spar. The mineral is a sedimentary rock and is formed from deposits of the bones of sea animals and also by precipitation of lime out of a solution. Chalk and coral are forms of limestone. Heat and pressure will change the mineral into marble, but ordinary limestone rock is formed merely by deposit.

This stone is not so hard as granite, but it is a serviceable building material and includes many beautiful varieties. It is also used in the smelting of ores, and in the manufacture of cement, lime, and glass. Limestone is widely distributed all over the world. In the United States, the principal areas of production include Pennsylvania, Indiana, Ohio, New York, Illinois, and Missouri.

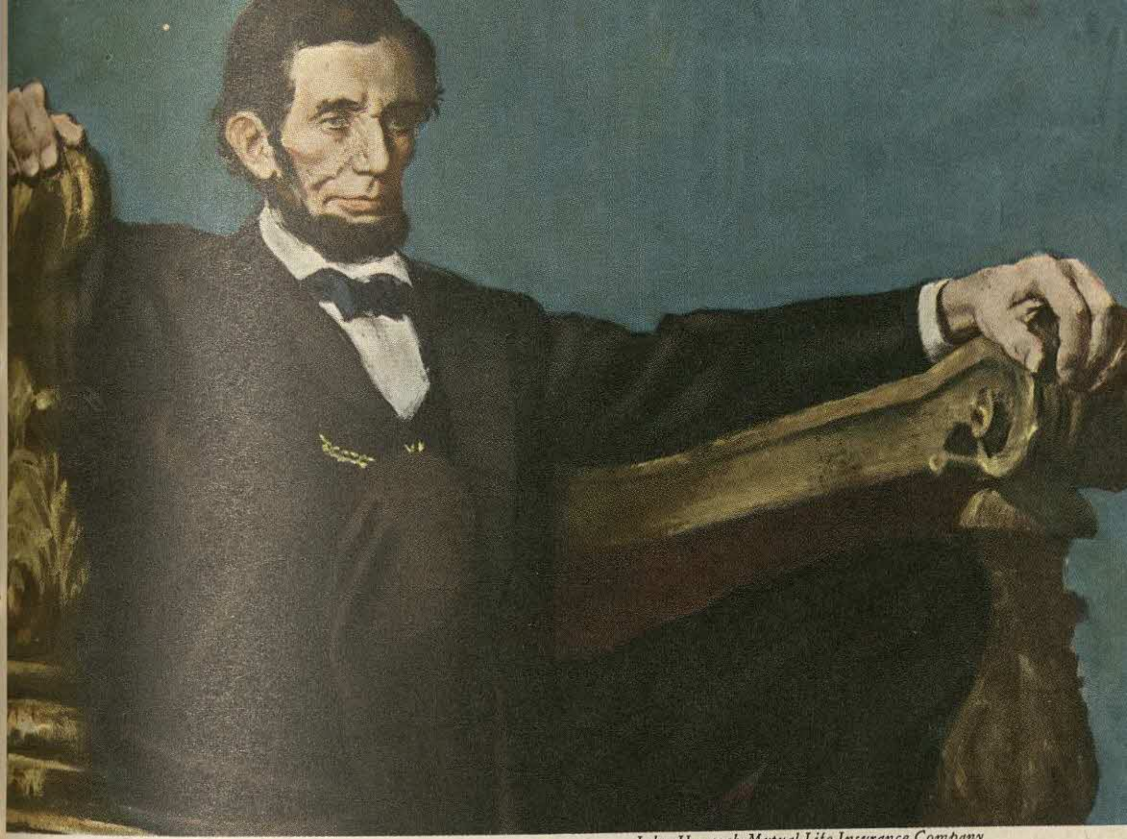
Consult the following titles for additional information:

Chalk
Coral
Dolomite
Marble

UP *from the* PRAIRIE

LINCOLN, *ling' kun,* ABRAHAM (1809-1865). "With malice toward none, with charity for all,"—no more fitting words describe Abraham Lincoln than do his own in his second inaugural address as sixteenth President of the United States.

Tall, lanky, not handsome, not a great scholar, Lincoln nevertheless had a simplicity of manner and speech and a fullness of understanding which made him beloved by his countrymen and which endeared him to those who knew him only



John Hancock Mutual Life Insurance Company

THE CHILD WAS FATHER TO THE MAN

Abraham Lincoln, above, as President of the United States, considered his position as a serious responsibility to all people. Even as a boy, below, he earnestly studied at night after working at odd jobs during the day. His reading of the Bible helped him to develop a powerful literary style, especially notable in the Gettysburg Address.

Copyright by the Lincoln National Life Insurance Company

by repute. It was not the subtle art of politics and intrigue which accomplished for Lincoln the task of preserving the Union, but his qualities of humanity and firmness of purpose. He was elected to preserve the Union, and his devotion to that ideal was at all times supreme. Never throughout the struggle which ensued did he resort to ruthlessness and inhumanity to achieve his purpose.

To him the nation owes an eternal debt for its preservation; to him the Negro owes his freedom; to him the world owes gratitude for the lesson he taught, that true greatness in statecraft combines leadership with understanding, kindness, and humanity—a new standard of measurement if we but recall those before him who were acclaimed "great," men like Napoleon, Caesar, and Alexander.

Boyhood of Lincoln. By heritage, birth, and training, Lincoln had much in common with Andrew Jackson. Both were of the common people; both claimed a log cabin as a first home; both secured a limited education through great personal effort and sacrifice; both entered the legal profession.

Thomas Lincoln, a carpenter and descendant of Samuel Lincoln, who came to America in 1637, was one of the band of hardy pioneers who had emigrated to the wilderness of Kentucky. He married Nancy Hanks, a fine woman who little deserved the life of hardship which became hers. Although she died when young "Abe" was only nine, the impression she left with the boy and the traits of character she engendered in him profoundly influenced his life.

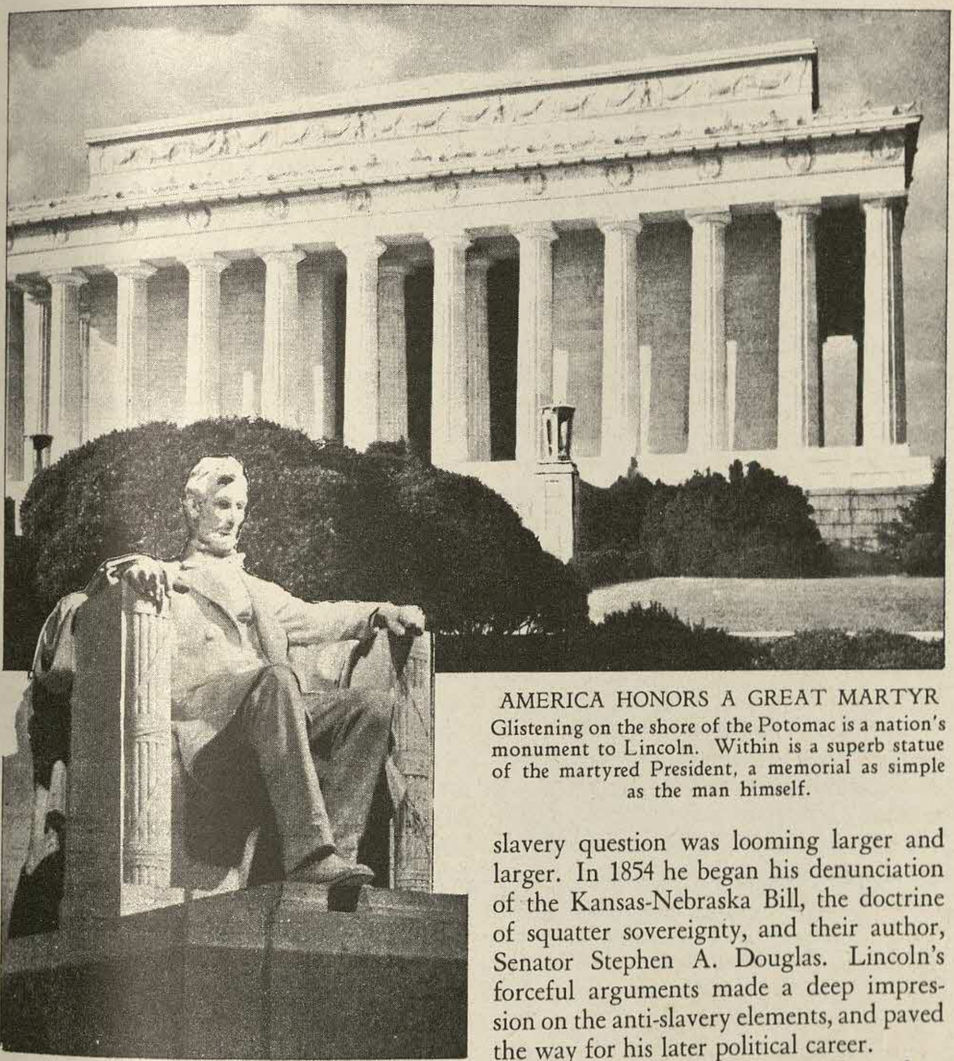
Lincoln was born February 12, 1809, in a log hut, floorless, without even the barest necessities of life, located in Hardin (now La Rue) County, Ky. Thomas Lincoln moved from this spot to another in Kentucky, and finally, in 1816, to a plot of land in Spencer County, Ind. There the seven-year-old Abraham helped his father to construct a cabin which was without windows, doors, or a floor at the time the family moved into it. Exposure and hardship proved too much for Nancy Lincoln. She became ill and died in 1818.

In the year following, Thomas Lincoln married Mrs. Sarah Bush Johnson, a widow with three children, who provided a comfortable home for the family and undertook the task of imparting the rudiments of knowledge to her stepson. From her and in very short periods spent in school, the boy learned to read, write, and "cipher." Starved for knowledge, he worked zealously with what he had. Lacking pencil and paper, he used chalk, writing on the cabin walls, on bits of wood, and on the back of an old, blackened shovel. From the neighbors, some far distant, he borrowed books and read them again and again. His own little library included the Bible, *Pilgrim's Progress,* Weems' *Life of Washington,* and *Aesop's Fables.* Here were the influences that developed in him a clearness and simplicity of style which few have been able to equal.

Early Career. Moving to Macon County, Ill., with his father when he was twenty-one, Abraham helped to build their new home. He earned his living partly by splitting rails for fences. In 1831 he built a flatboat and took a load of produce down the Mississippi to New Orleans, for John Hanks, a relative of his mother. A similar trip had previously been made in 1828, but young Lincoln was sharply impressed on this trip by the evil of slavery in the South. Profoundly affected, he voiced his first opinions against it.

After participating in the Black Hawk War, he returned to the settlement of New Salem, Ill., engaged in a rather unprofitable venture in a dry-goods and grocery business, and in 1833 was made postmaster of the town. While serving in this capacity, he studied law and politics and worked as deputy surveyor for the community.

Lincoln entered politics when he was elected to the lower house of the state legislature in 1834, serving for eight years. During this time he supported the then unpopular woman-suffrage movement and



AMERICA HONORS A GREAT MARTYR
Glistening on the shore of the Potomac is a nation's monument to Lincoln. Within is a superb statue of the martyred President, a memorial as simple as the man himself.

argued against slavery. However, it was Lincoln's belief that Congress could not interfere with existing slavery without violating the Constitution. Moving to Springfield, the new capital of Illinois, in 1839, he opened a law office with **John T. Stuart** as a partner. In 1842 he married Mary Todd, daughter of Robert S. Todd of Lexington, Ky. In 1846 he was elected to Congress.

Pre-Presidential Years. Retiring from Congress after one term, Lincoln returned to his law practice. But not for long could he remain aloof from politics, for the slavery question was looming larger and larger. In 1854 he began his denunciation of the Kansas-Nebraska Bill, the doctrine of squatter sovereignty, and their author, Senator Stephen A. Douglas. Lincoln's forceful arguments made a deep impression on the anti-slavery elements, and paved the way for his later political career.

The new Republican party, formed to combat the extension of slavery, held its first convention in 1856, and the name of Lincoln figured prominently. Two years later, in the famous Lincoln-Douglas debates on squatter sovereignty and a divided Union, that name gained nationwide attention despite a defeat for Lincoln in the campaign for election to the Senate. By forcing Douglas to take a position that pleased the Northern Democrats, Lincoln lost the race, but Douglas forfeited his chance to become President. Lincoln's prestige was even more enhanced by the notable Cooper Union speech in 1860, and at the next Republican convention in Chicago, he emerged victor over such strong and popular candidates as William H. Seward and Salmon P. Chase.

The slavery issue by now had divided the Democratic party; Douglas was nominated by the Northern section and John C. Breckinridge of Kentucky by the slavery advocates. A fourth group, known as the Constitutional Union party, assumed a neutral stand and nominated John Bell. Lincoln polled 180 electoral votes out of 303, although falling short of a popular majority by almost a million votes.

The Presidency and War. The election served to inflame Southern sentiment to a point where it was transformed into action. South Carolina seceded from the Union, and was followed by a number of other states within a few months. It was a Union already divided that Lincoln addressed in his memorable inaugural speech in March, 1861.

In vain he pleaded on that day for a united nation. Realizing that no longer was he confronted simply by threats, Lincoln made preparations for averting a civil war by appointing an able Cabinet from both North and South, including the two outstanding veteran politicians, Seward and Chase. It was too late, for on the morning of April 14, Fort Sumter was taken by the South and cries of "War!" resounded throughout the country.

Not a military strategist himself, Lincoln chose other men to carry on the technical aspects of the conflict while he supplied the stability, firmness, foresight, and patience necessary to hold together a warring nation. All terms of peace were rejected as long as secession continued.

On January 1, 1863, as a strategic move to satisfy the North, undermine the economic security of the South, and gain the support of the Negro, Lincoln issued the famous Emancipation Proclamation, declaring all slaves free in territory in rebellion against the government. Only a few months before, however, he had said, "My paramount object is to save the Union; it is not either to save or to destroy slavery."

The first two years of the war were favorable to the South. It was not until the summer of 1863 that the tide changed, when Meade held General Lee at Gettysburg and Grant took Vicksburg. In November of that year, Lincoln delivered his short, inspiring dedication of the battlefield of Gettysburg (see GETTYSBURG ADDRESS).

When the election of 1864 occurred, Lincoln's popularity faced a test. The Draft Act, the suspension of habeas corpus, and other drastic measures created many bitter enemies, and in some quarters Lincoln was condemned as a tyrant. The opposing political forces nominated General McClellan, who had been removed from command of the Union army; but the people elected Lincoln.

During the period from 1861 to 1865, numerous national measures were enacted, including a Homestead Law which encouraged settlement of the West. Before the close of the war there were 20,000 farms in the new area, and agriculture prospered, aided by the invention of an improved McCormick reaper. The cotton industry, however, was crippled in the South because of embargoes and loss of man power. The Bureau of Agriculture was formed in 1862, and in that same year the first greenbacks were issued. Money was scarce in both the North and the South, and both governments were forced to resort to fiat money (see FIAT MONEY). In 1863 the National Banking Act was passed.

The Death of the President. On April 9, 1865, Lee surrendered at Appomattox Court House; and five days later there occurred one of the greatest single tragedies in the history of the United States. The man who had lived to see the Union preserved largely by his own efforts was assassinated by John Wilkes Booth in Ford's Theater in Washington. Abraham Lincoln died the following morning, mourned by the North as its great leader and by the South as a kind, sincere, and magnanimous opponent. His body was

returned to Springfield, Lincoln's home city, for burial.

In 1922 was dedicated the magnificently simple Lincoln Memorial, on the banks of the Potomac, in Washington. Of whitest marble, the lovely Greek temple houses the great statue of Lincoln executed by Daniel Chester French. Always before it stand hushed and reverent pilgrims of a grateful nation.

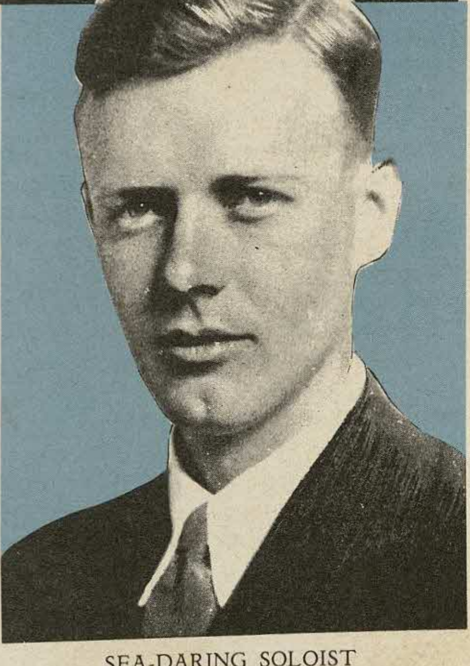
Consult the following articles for additional information:

Booth, John Wilkes
Civil War in America
Douglas, Stephen Arnold
Emancipation Proclamation
Johnson, Andrew
Kansas-Nebraska Bill
Political Parties in the United States
Squatter Sovereignty

LINCOLN, Neb. Lying fifty-five miles southwest of Omaha, Lincoln, capital of the state and county seat of Lancaster County, is a typical example of a city which has grown because of the importance of its surrounding farm lands.

The city is important as a distribution point, and lists among its industries the repairing of railway cars, processing of foods, and making of rubber, wood, and metal products, watches, telephone equipment, and gasoline engines. Railways, airlines, and fine highways provide excellent transportation, and several large insurance companies have their home offices there.

Lincoln is the home of the University of Nebraska, Nebraska Wesleyan University, Union College, the state museum, and a Federal veterans' hospital. Originally called Lancaster, it was named after Abraham Lincoln and made the capital in 1867. William Jennings Bryan lived there many years. The population is about 129,000.



SEA-DARING SOLOIST

America's twentieth-century hero is Charles A. Lindbergh, first man to fly the Atlantic alone. Top, his famous *Spirit of Saint Louis*.

LIND'BERGH, Charles Augustus (1902-). One May morning in 1927 an unknown young aviator climbed into the cabin of his monoplane at Roosevelt Field, N. Y., gunned his motor, and pointed the ship skyward for Paris.

Until that day the world did not know Charles A. Lindbergh, Detroit-born son of a former Congressman. Like many other boys, he was fascinated from childhood by mechanics, and especially by aviation; he entered an aeronautical school at twenty, spending two years at the Army Flying School at Kelly Field, Tex. Then he was commissioned a second lieutenant. Late in 1925 he enlisted in the Missouri National Guard and the next year he was made a captain. He started as an air-mail pilot in April 1926 on the Saint Louis-Chicago route. With the backing of Saint Louis friends he obtained his famous monoplane, *The Spirit of Saint Louis*. In it he made a record flight from San Diego to New York City, and then about a week later his history-making hop across the Atlantic. It was early in the morning of May 20, 1927, that he took off from Roosevelt Field, New York, and the world woke up and cheered the "Lone Eagle." Thirty-three hours and twenty-one minutes after take-off he landed at Le Bourget Field, Paris. It was the evening of May 21. The tired young man received a tumultuous welcome that voiced the thrill felt around the world. He received a prize of $25,000 from Raymond B. Orteig for the first New York to Paris non-stop flight. The French awarded him the Legion of Honor. The British gave him the Royal Air Force Cross. The United States gave him the Distinguished Flying Cross and the Congressional Medal. He was made a colonel.

At the invitation of President Calles, he flew non-stop to Mexico City in December. He was a guest there of United States Ambassador Dwight W. Morrow, whose daughter Anne became Lindbergh's wife (1929). The trip included several Central American countries, and for this "good will" mission he received the Woodrow Wilson medal and $25,000. In 1928 he was made chairman of the technical committee of Transcontinental Air Transport. In 1931, with Mrs. Lindbergh as radio operator and co-pilot, the Lindberghs flew across northern Canada, Alaska, and the Bering Sea to Japan. *North to the Orient* is Mrs. Lindbergh's book on the flight. They made a 30,000-mile flight in 1933, touching Greenland, Iceland, the leading cities of Europe, the west coast of Africa, Brazil, Trinidad, and Puerto Rico.

Tragedy that shocked the nation struck the Lindberghs in 1932, when their infant son, Charles, Jr., was kidnaped and murdered. The Lindberghs moved to England in 1935 and lived there until 1939. Lindbergh collaborated with Dr. Alexis Carrel in inventing an artificial heart and lungs. (See CARREL, ALEXIS.) The Lindberghs had five more children.

Colonel Lindbergh actively opposed involvement of the United States in World War II. Under criticism by President Roosevelt he resigned from the air corps, but after Pearl Harbor he again offered his services. In 1942 he joined the Ford Motor company as a research engineer in war production. Not until twelve years after the war was it revealed that he saw active duty. He was made special advisor to the air corps in 1949. He wrote an autobiography (1927), *Of Flight and Life* (1948), and *The Spirit of Saint Louis* (1953).

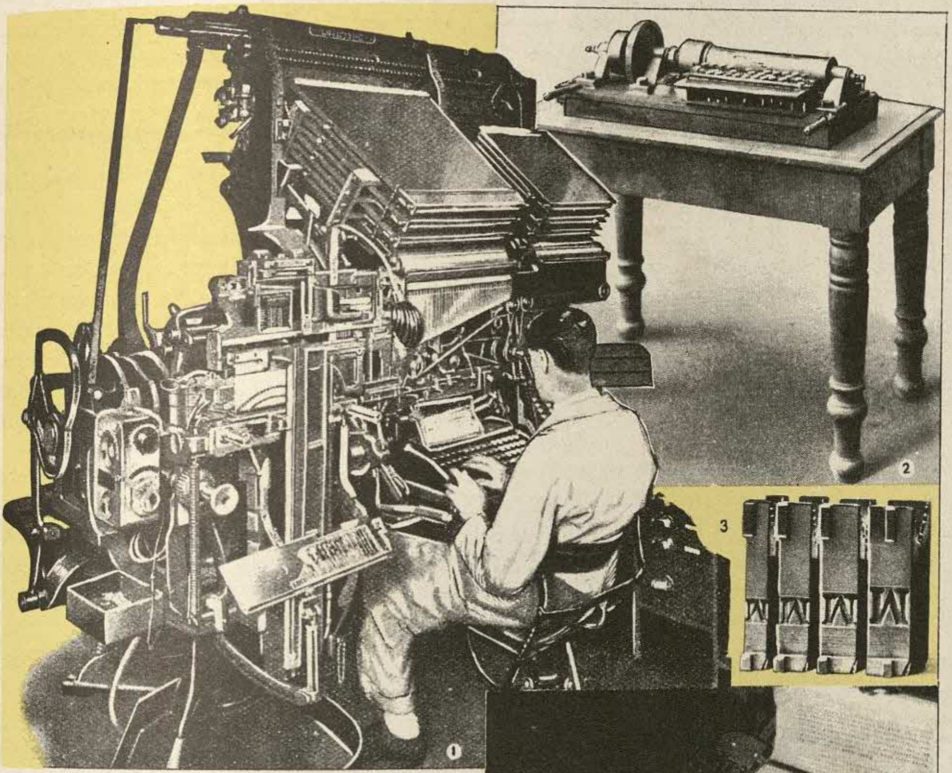
LIN'DEN. See BASSWOOD.

LIN'EN. The phrase "Everything from dainty, lustrous cloth to coarse canvas and rope" well describes the varied uses of linen, one of the oldest fabrics known to man. It is made from the fiber of flax, and its threads may be woven into lawn, damask, dress linens, toweling, sheeting, crash, and duck. Linen has even been used as the sails of ships and as a covering of airplane wings.

The making of linen originated in Egypt, later spreading to Greece and Rome, and finally to Spain, France, and the British Isles. The French are noted for their fine lawns and cambrics, as are Holland and Ireland. The linen industry in America is confined to the making of thread, twine, and toweling, and, compared to the cotton industry, is unimportant.

Linen absorbs water readily, gives it up quickly, and dries rapidly. It is easily laundered and has a beautiful gloss when properly ironed. Among textiles it is outstanding for strength, fineness, and luster. Linen does not take dyes easily, and stains can usually be removed without great difficulty. See FLAX.

LIN'NET. Popular and numerous in Europe, the linnets belong to the finch



"WRITING" IN MOLTEN LEAD

The operator taps out a line of words on the keys, and individual type molds line up. Type metal is cast in the mold, producing a slug, which falls into the tray at the operator's left (1). (2) An early model (1883). (3) Display type molds (*matrices*). (4) Keyboard.

family and are commonly confined in cages. They thrive in England, making their homes in firs and small bushes. The *redpoll,* a species of linnet, is found in the United States as well as in Europe.

LINOLEUM, *li no' le um.* See FLOOR COVERING.

LINOTYPE, *line'o tipe.* In the early days of printing, each character was picked by hand from large type cases and arranged in line to be used in printing. Today the linotype sets solid lines of type as fast as eight men used to do it by hand. It works somewhat on the principle of a giant typewriter, but does not print; it merely casts lines of characters.

As the operator taps keys, the matrices, or brass molds, fall in order until a full line is set; then the line of matrices moves automatically to the casting apparatus, where it is filled with molten type metal. Cooling, this metal emerges as a solid line bearing the characters reproduced from the matrices, which automatically are returned to their proper channels for use again. The machine automatically spaces the words to fill the line properly.

"HUT, 2, 3, 4"

On the road of Kruger National Park in South Africa, left, lions march in perfect step beside modern automobiles. Motorists prudently keep their car windows closed.

South African Tourist Company

CUBS TRY A GNU MENU

Out on the African plains, mother lion (below) teaches her hungry cubs to develop a new taste—for the flesh of a freshly slaughtered gnu.

Copyright Walt Disney Productions

Nearly all newspapers and many magazines and books are set by linotype. Much large display type is still hand-set. If there is an error in the text set by linotype, the entire line must be reset, since it was cast as a solid unit.

Ottmar Mergenthaler of Baltimore, Md., invented the linotype machine, and secured a patent in 1885.

LIN'SEED. Important by-products of the flax plant include the oil and meal obtained from the seeds. The flax plant belongs to the genus *Linum;* thus the seeds are called linseed, just as the fabric woven from the fiber is called linen.

Linseed oil is obtained by crushing the oil from the seeds in great presses. Newer methods involve mixing the seed with solvents such as naphtha, which dissolves the oil. The naphtha is later evaporated. There are two forms of linseed oil, *boiled* oil and *raw* oil. The former contains some oxide of lead, causing the oil to be quick-drying. It is used for inside paints and varnishes. Raw oil, though it dries more slowly, is more weather-resistant and is used in outside painting. Pure linseed oil is dark brown in color and has a disagreeable taste and odor.

After the oil is pressed from the seed, the hard cakes remaining are ground into linseed meal for feeding cattle and horses. Exceptionally rich in protein, it is fed only in small quantities and is an excellent tonic and conditioner for "run-down" animals.

LION, *lī'un.* Although the lion has been given the title "King of Beasts," there are some who claim that, from the standpoint of nobleness, bravery, and appearance, this animal is not entitled to the name.

Lions are the biggest of the cats. Some tigers may equal them in size, but few do. A full-grown lion may reach a length of nine or ten feet, including his tail. He stands about three feet high at the shoulder and may weigh over 500 pounds. The males are larger than the females and differ also in having a dark mane. Lions have long, tufted tails and are usually tawny.

Lions are now found at large only in the brushlands of Africa and of southwestern Asia. Like tigers and leopards, they do most of their hunting at night, usually attacking wild creatures but sometimes going after domestic animals. By nature, lions are not inclined to attack man, but fear, anger, or hunger can make them very fierce, dangerous opponents. Born in the spring, usually two or three at a time, the whelps, or cubs, are tenderly looked after until they can care for themselves. Full-grown at five or six years, lions usually live to be about twenty-five years old. They do well in captivity and are found in most modern zoos.

LIP READING. This method of understanding what another says without hearing his words has been so perfected since the 1850's that it is rapidly replacing the older sign language as a means of communication for the deaf. By simply watching the movements of the speaker's lips and his facial expressions, a skilled lip reader can understand what is said so well that his deafness is practically unnoticed. Even one who is blind, as well as deaf, can learn to read lips by touching the mouth and face of the speaker with his fingertips.

Lip reading is now taught in all schools for the deaf, in many large-city special classes, in veterans' hospitals, and by private teachers in various places. There are also many books on the subject, from which a person may learn lip reading by carefully following the instructions and using a mirror as an aid. Learning to lip-read can be a fascinating hobby for those with normal hearing. See DEAF AND DUMB.

LIQUID, *lik'wid.* All known substances in nature exist in one of three states, the *solid,* the *liquid,* or the *gaseous.* We are familiar with some in all three forms. Thus ice, water, and steam are three forms of the same substance. The tallow of which candles are made also has three forms. The candle is solid, the tallow melts and exists as liquid around the flame, and the flame itself is partly a burning gas.

A liquid is a substance whose molecules under normal conditions of temperature and pressure are free-flowing but do not tend to separate from one another, as do the molecules of gases. Placed in a vessel, a liquid takes the container's shape, rises to the same level in all its parts, and maintains a constant volume. Put into a gas with which it does not mix, such as air, it forms spherical drops. All gases and most solids can be liquefied. See MATTER.

LIQUID AIR. Any gas can be liquefied if it is cooled and compressed sufficiently. Air that has been freed from carbon dioxide and water vapor is chiefly a mixture of oxygen and nitrogen. The liquefying machine, through which this mixture of gas is put, is essentially a coil ending in a small opening. The gas under high pressure is allowed to flow through this small opening and it expands as it escapes. Cooling accompanies the expansion. This cooled gas is passed back to cool the oncoming compressed gas; and after a time the compressed gas is reduced enough in temperature so that, on expansion, as it leaves this small opening it liquefies.

Liquid air boils at about 300° F. below zero. In contact with it, many substances like alcohol, kerosene, and mercury can be frozen.

Liquid nitrogen boils at a lower temperature than does liquid oxygen. The former, being more volatile, can be nearly completely separated from the latter by a process of fractional distillation (see DISTILLATION). In this way oxygen and nitrogen are made commercially to a large extent, for use in processes that require them. Small amounts of helium are also obtainable in the distillation process.

LIRA, *le'rah.* Just as the dollar is the monetary standard of the United States, so is the silver lira the basic coin of Italy. It was stabilized at 5.26½ cents in 1927. In 1941, it was worth only 5.07 cents.

LIS'TER, JOSEPH, first Baron (1827-1912). Joseph Lister must be considered a benefactor to mankind, for his work in the use of antiseptic methods in surgery. Born at Upton, Essex, Lister served as professor of surgery at Glasgow University from 1860 to 1869, and in a similar capacity at the University of Edinburgh until 1877. In that year he was appointed professor of clinical surgery in King's College in London. Many of his papers on surgical pathology are important for their explanations of the application of antiseptic treatments in surgery.

PIANIST

Musician extraordinary was Franz Liszt, greatest piano artist of his day. Above, at a recital for royalty. Left, the man himself Liszt won many award medals.

LISZT, *list,* FRANZ (1811-1886). The greatest pianist of the nineteenth century was the Hungarian musician, Franz Liszt, who also ranks among the finest of romantic composers.

He made his first concert appearance at the age of nine, and studied in Vienna and Paris. For a few years he lived in Switzerland, and then at Weimar in Germany. He went to Rome in 1861 and became a Franciscan abbé in 1864. Following this period, Liszt divided his time between Rome, Weimar, and Budapest, where he was the director of the Conservatory of Music. His chief works are the *Faust* and *Dante* symphonies, but he is best known for his popular Hungarian Rhapsodies. His introduction of the symphonic poem as a musical form is one of his contributions to music.

LIT'ANY. In the Roman Catholic Church, the litany is a solemn appeal to God to be merciful. In public devotions it takes the form of alternating prayers and responses by the priest and people. The litany is a complete service, but may be used as a part of the service on special days. There are five litanies approved for public service—the litanies of *Loreto, the Holy Name, the Saints, the Sacred Heart of Jesus,* and *Saint Joseph.* Litanies are often said in times of famine or pestilence and at consecrations. In the early Church the most common form of litany was *Kyrie eleison* (Lord have mercy), recited by the priest, with the congregational response of *Christe eleison.*

LITER, *le' tur.* In the metric system of weights and measures, the standard measure of capacity is the liter. It is the equivalent of a cubic decimeter, or 61.025 cubic inches in the English system. A liter jar will hold .264 of a gallon, or 1.056 quarts. See METRIC SYSTEM.

LITERATURE. In its broadest sense, literature has been defined as the lasting expression in words of the meaning of life. When we speak of the literature of a nation or of a people, we include all of their life and thought which has found lodgment in language. But in its more restricted meaning, literature is classed with other forms of fine art and includes only such forms of expression as make an appeal to the higher emotions or intellect of men.

LITERARY IMMORTALS OF THE PAST

These men of letters, in centuries gone by, produced art that is good for eternity. (1) Vergil, Horace, and Varius chatting. (2) The matchless Homer. (3) England's Chaucer. (4) Dante.

Even in its narrower sense it expresses itself in a variety of forms. The two main classifications of literature are prose and poetry. Under prose are essays, letters, biographies, orations, histories, debates, short stories, novels, and certain kinds of dramas. Under poetry are the drama and poems of every description—lyric, narrative, and epic.

English Literature. English literature began with the tales and songs of the fighters and hunters of early England. On long winter evenings they sat around the fire and listened to these songs of bard and gleeman. The bards were the real poetry makers, for they took the legends and tales of warriors and shaped them into literary form. The gleemen went about and merely sang the songs they had learned from others. The most important collection of these lays is in the famous epic *Beowulf*. Although it was not written until the tenth century, the epic goes back as far as the sixth century for its inspiration, and represents the literary efforts of the intervening centuries.

The first poem that really originated in England is Caedmon's *Paraphrase,* a metrical version of the Bible. The Norman Conquest changed the development of English literature. The clergy used Latin almost exclusively and other persons of prominence used French, or Anglo-Norman as it was called. The latter part of the fourteenth century presented a mixture of the old and new. About this time was written what has been called the first great poem, the *Vision of Piers Plowman,* and John Wycliffe translated the Bible into English. Soon came forms of literature which at least were comparatively artistic. One reached its height in the work of Geoffrey Chaucer (1340?-1400), England's first great poet.

With Chaucer may be said to have closed the age of preparation in literature, for thereafter the development, though gradual, was steady. After the introduction of printing in the fifteenth century, books multiplied rapidly; but, nevertheless, it was not until Queen Elizabeth I's reign that English literature took the position of first importance in the world. Essays influenced by science and the sparkling wit of the day; poetry, glowing with the love of nature; and superb dramas were produced in these resplendent years.

During this period, literature, especially the drama, reached its peak. About this time, elaborate theaters were built. They stimulated a brilliant group of dramatists, such as Lyly, Peele, Kyd, Greene, and the greatest of the minor artists, Christopher Marlowe. This group created the romantic drama, with its forms of tragedy, comedy, and history, which served as an inspiration to the master of dramatic art, William Shakespeare.

This was a productive age and several other dramatists deserve mention. Second to Shakespeare is Ben Jonson. In contrast to Shakespeare, he stood out boldly for classical ideals in drama. His plays were exceedingly popular in his time. Jonson is renowned also for his beautiful lyrics. The non-dramatic literature of the age is best represented by the works of Edmund Spenser. In his masterpiece, *The Faerie Queene,* he sums up the effects of the Renaissance.

During the Puritan Age, which closed in 1660, English writers changed their style completely and in so doing subordinated the love of the beautiful to the search for truth. Milton, the one great literary man of his age, shows in his poetry the changes that were taking place. During the first part of his career, Milton himself wrote prose, and some of his later works were in prose. But his claim to immortal fame rests upon poetry, particularly *Paradise Lost,* although his minor poems are unsurpassed in many respects. Aside from Milton's poetry, the greatest work of the century was in prose. The King James version of the Bible appeared in 1611, and Jeremy Taylor's *Holy Living,* in 1650.

With the restoration of Charles II, English literature quickly responded to French influences and rapidly developed into the striking brilliancy and beauty of the Age of Queen Anne. The chief poet of the Restoration Age was Dryden. *The Pilgrim's Progress* by Bunyan is another outsanding prose work of the age. *Essay Concerning Human Understanding* by Locke and *The Principia* by Sir Isaac Newton are other notable prose productions.

The eighteenth century is sometimes called the Classical Age, and Pope was its chief exponent. Attention to form rather than content was uppermost. Pope's *Essay on Criticism* and *Essay on Man,* written in pentameter couplet, represent the literary spirit of this age. The essays of Addison and Steele in the *Tatler* and the *Spectator* illustrate a new interest in prose. A little later, in 1719, Defoe wrote his fascinating story *Robinson Crusoe,* and in 1726 Swift wrote *Gulliver's Travels.* Each of these prose forms makes its peculiar contribution to the novel.

The first prose production that has all the elements of the modern novel, including romantic love interest, is Samuel Richardson's *Pamela,* published in 1740. Fielding, the author of *Tom Jones,* contributed greatly to the development of the novel. Samuel Johnson, author of *Rasselas* and numerous literary criticisms, lived at this time. Other prose writers of the latter part of the eighteenth century were Hume, author of essays and *History of England,* and Gibbon, who wrote *The Decline and Fall of the Roman Empire.*

Some of the prominent writers of the latter part of the century were Goldsmith, William Cowper, and Ayrshire's famous poet, Robert Burns.

During the first half of the nineteenth century appeared a group of poets whose work typifies the Romantic movement in England. Leading the way were Scott, Wordsworth, Coleridge, and Southey. In 1798 appeared anonymously the little volume of *Lyrical Ballads,* by Wordsworth and Coleridge. This publication had a marked influence on all later poets in that it dared to use in poetry the language of everyday life instead of the conventional words that characterized the works of the Classical poets.

Three other outstanding poets of this period were Shelley, Byron, and Keats, each representative in his particular way of the Romantic school that defied convention.

Scott is renowned for both poetry and prose, and he did more to bring the novel to popular notice than any other writer. About this time the genial Charles Lamb wrote his *Essays of Elia* and *Tales from Shakespeare.*

The Victorian Age, which followed, is noteworthy for its great variety of excellent literature. It produced two of the nation's greatest poets, Tennyson and Browning. The ethical ideals of his time found expression in much of Tennyson's poetry, while Browning's poetry is characterized by dramatic vigor and optimism. One can hardly discuss Browning's works without thinking of Elizabeth Barrett Browning, his wife, and of her delightful *Sonnets from the Portuguese.* Other poets of this age are Matthew Arnold, Swinburne, Dante Gabriel Rossetti, and his sister, Christina.

It was in the Victorian Age that the novel, already made popular by Scott, became the chief form used for imaginative literature. Dickens, Thackeray, George Eliot, Jane Austen, Charlotte Brontë, Charles Kingsley, and Robert Louis Stevenson all brought distinction to this period.

The remarkable thing about the prose of the age is its variety. The essay and history as well as the novel attained a new standard. Macaulay's essays and his *History of England;* Carlyle's essays and his *French Revolution;* DeQuincey's *Confessions of an English Opium Eater,* and John Ruskin with his *Seven Lamps of Architecture* give us but a glimpse of the great body of prose literature produced within a comparatively few years. When we add to this list the writers of science, such as Lyell, Darwin, Huxley, and Spencer, we realize that literature made more progress during the Victorian Age than in any other age, with the possible exception of the Elizabethan.

Interest in the novel did not end with the writings of George Eliot. George Meredith, though a contemporary of Eliot's, continued writing much later. With the possible exception of Thomas Hardy, Meredith was the foremost novelist of his day. Hardy, who was both novelist and poet, has been called the last of the great Victorians and the first of the moderns. During this time Rudyard Kipling, "the Laureate of the Empire," was writing prose and poetry.

The twentieth-century period follows the Victorian Era. In the new age, people have become more and more interested in literature dealing with realistic subjects and situations—novels and dramas based on "problems," but not with a heavy moral atmosphere and not in a preachy style. This same tendency probably accounts also for the keen interest in works of biography and history.

Among the novelists of this era are John Galsworthy, Arnold Bennett, H. G. Wells, Hugh Walpole, Joseph Conrad, G. K. Chesterton, and Somerset Maugham. Dramatists include George Bernard Shaw, Sir James M. Barrie, Sir Arthur Pinero, Henry A. Jones, and John Galsworthy. Well-known poets are Robert Bridges, John Masefield, and Alfred Noyes. Outstanding among writers of biography is Lytton Strachey.

American Literature. In any study of American literature as such, we cannot expect to find very much literature of importance before the nineteenth century. Practically all of the novelists, historians, essayists, and poets whose names we associate with American literature lived after 1800.

During the Colonial Period, literary activity was chiefly religious and historical. Near the close of the seventeenth century, Cotton Mather wrote on deeply religious subjects. In the early part of the next century, Jonathan Edwards also wrote numerous treatises on religion. The author of this period whose writings are most often referred to and quoted today was Benjamin Franklin.

The main interest in the latter part of the eighteenth century was in historical and governmental matters. This kind of writing found expression in *The Federalist,* essays by Hamilton, Madison, and Jay in support of the Constitution. The poems of Philip Freneau showed real literary merit. The first American novelist of distinction was Charles Brockden Brown, author of horror romances.

The National Era of American literature began with Washington Irving. He was the first to command attention in other nations. Hardly had Irving gained general recognition when James Fenimore Cooper began writing his stories of frontier life.

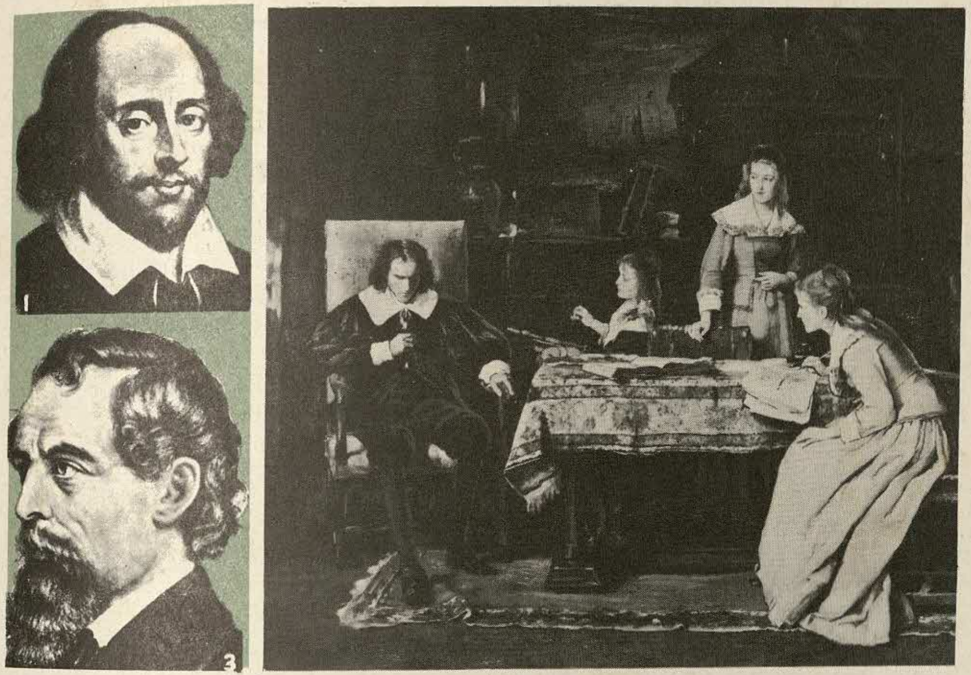
While Irving and Cooper were attracting attention, the *North American Review,* by publishing Bryant's *Thanatopsis,* introduced a great nature poet. Bryant's translations of the *Iliad* and *Odyssey* and numerous original poems gained instant recognition and demonstrated that American poetry deserved a permanent place in world literature. Bryant was the first of a number of notable American poets, including Longfellow, Whittier, Poe, Holmes, Emerson, and Lowell; these are so well known that it is unnecessary to list their poems here.

Near the latter part of the century there appeared two other poets, who, though not of the first rank, are greatly enjoyed throughout America. They are James Whitcomb Riley and Eugene Field. Other poets who wrote during the latter part of the nineteenth century and in the early years of the twentieth are Sidney Lanier, Walt Whitman, Emily Dickinson, Henry Van Dyke, William Vaughn Moody, Paul Lawrence Dunbar, and Edwin Markham. Edwin Arlington Robinson, Robert Frost, Edgar Lee Masters, Harriet Monroe, Amy Lowell, Edna St. Vincent Millay, Sara Teasdale, Carl Sandburg, and Vachel Lindsay are representative poets of the twentieth century.

Among historians should be mentioned George Bancroft, William Prescott, Francis Parkman, John Lothrop Motley, John Fiske, Theodore Roosevelt, Woodrow Wilson, James H. Breasted, James Truslow Adams, and Charles and Mary Beard.

America's contribution to the novel was only begun by Irving and Cooper. They were followed by the most artistic novelist in American literature, Nathaniel Hawthorne. Since Hawthorne's day, America has produced many novelists worthy of mention, among them William Dean Howells, Henry James, Booth Tarkington, Winston Churchill, Zona Gale, Edith Wharton, Willa Cather, Sinclair Lewis, Pearl Buck, Margaret Mitchell, Theodore Dreiser, and Thomas Wolfe.

Greek Literature. Whenever reference is made to Greek literature we think of the *Iliad* and the *Odyssey,* whose traditional author, Homer, has been called the father of poetry. These epics were models for later poets.



THREE MIGHTY FIGURES OF ENGLISH LETTERS

No culture has ever produced a greater literature than England's; no poet surpasses England's Shakespeare (1). Immortal are the blind Milton (2) and the novelist Dickens (3).

Greek literature made an outstanding contribution to drama. Aristophanes and Menander were masters of satire and did much to create comedy as a dramatic form; whereas Aeschylus, Sophocles, and Euripides produced great tragedies. To Greek historians, such as Xenophon, Herodotus, and Thucydides, we are indebted for our knowledge of the earlier peoples.

The open forums of Athens were made famous by displays of oratory. The model for all orators is Demosthenes. In philosophy, Greece had no rivals. In one way and another, Socrates, Plato, and Aristotle have never been surpassed by later thinkers. They wrote the world's textbooks on philosophy, from which all later thinkers have gained inspiration.

Roman Literature. There were crude beginnings of a Roman or Latin literature before the period of Greek influence, which began about 240 B. C. This influence was felt more in poetry than in prose. Although the Romans were imitators, their literature greatly influenced the literature of other countries. Cato the Censor was the most important writer of this early period.

During the Golden Age, or classical period, from 84 B. C. to A. D. 14, Cicero, Caesar, and Livy, the historian, were the great prose writers, and Lucretius, Catullus, Vergil, and Horace the great poets. The first half of the classical period was called the Ciceronian Age. During this age, prose reached its highest point. The Augustan Age, from 43 B. C. to A. D. 12, was mainly an age of poetry. Vergil's epic, the *Aeneid,* and Horace's *Odes* became widely known. Ovid wrote a long poem and a number of minor ones of less distinction.

In the Silver Age, from A. D. 14 to 117, appeared Tacitus, the historian; Pliny the Younger, who wrote letters; and Juvenal, the satirist. A few important writers appeared later, but Latin literature may be said to close with Tacitus.

French Literature. Until the ninth century, the literary language of France was

Latin. The *Chansons de geste,* or songs of deeds, centering around Arthur and Charlemagne, were the first literature in French. Later came the love songs of the troubadours and the verses of the trouvères in honor of their kings and knights.

The revival of classical learning in the sixteenth century stirred France. It produced a number of literary figures, such as Rabelais, "the jester of France," and Montaigne, the skeptic and brilliant essayist.

The Golden Age of French literature was in the latter part of the seventeenth century. In drama, Corneille and Racine wrote tragedies, and Molière attained first rank among writers of comedy. In the eighteenth century the most outstanding figure was Voltaire, noted for his vicious attacks on the philosophy and religion of the day. Rousseau was a revolutionary writer in education and social studies.

The Romantic revival in the early nineteenth century was led by Victor Hugo; writing also were the novelist Dumas the Elder and the poets Alfred de Musset and Théophile Gautier. Balzac, ranked as the greatest French novelist, and George Sand best represented the trend toward Realism after 1830. In the period of Naturalism, which covered the last half of the century, were the novelists Gustave Flaubert, Emile Zola, Guy de Maupassant, and Anatole France; the dramatist Dumas the Younger; the historians Renan and Taine; and the philosopher Bergson. The poetry of Verlaine and Baudelaire was popular.

German Literature. German literature began with the songs of the minstrels. Charlemagne made a collection of German popular poetry; and during the age of chivalry, men of all classes were included among the minnesingers, or singers of love, who strolled from castle to castle and sang of the Trojan heroes and of King Arthur and his knights. Many of these songs are recorded in the great epic, the *Nibelungenlied,* published early in the thirteenth century.

As interest in the Crusades waned, poetry became stilted and artificial. In the fifteenth century the mysteries and passion plays became popular.

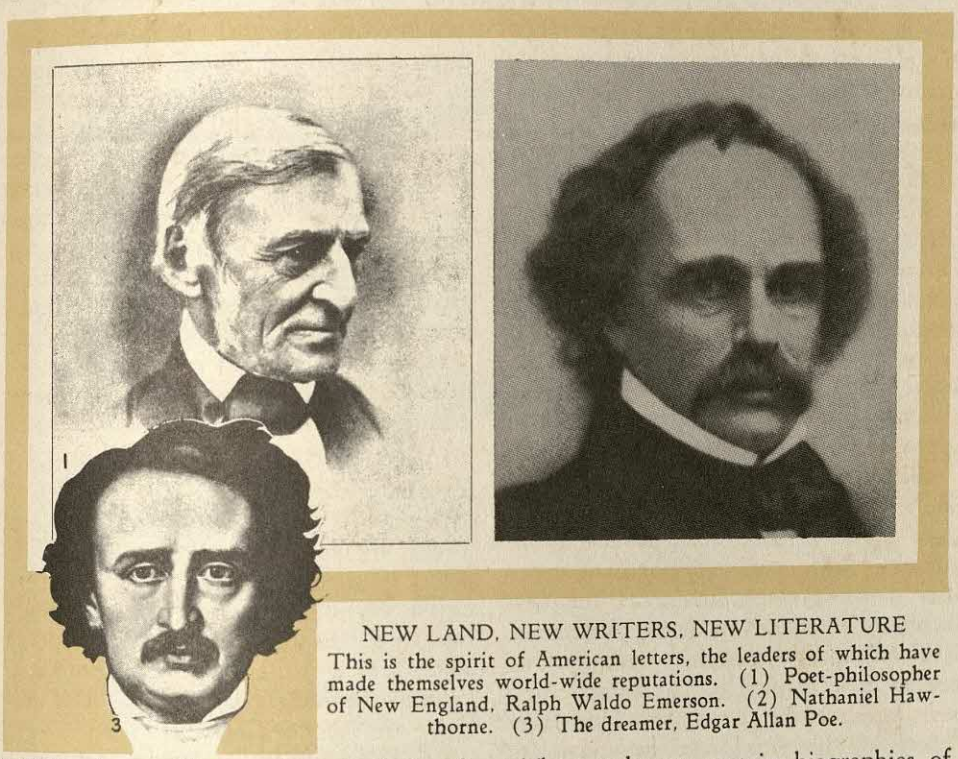
The Reformation altered the trends in literature. The attention of all classes focused on the outcome of the religious movement. It was at this time that Martin Luther translated the Bible and determined the form of the literary language in Germany. Outstanding among the poets of the era was Hans Sachs, whose poetry and songs also reflected the spirit of the Reformation.

It was not until the eighteenth century that German literature really came into its own with a new spirit of nationalism. The reign of Frederick II was as productive for German literature as the Elizabethan Age had been for English. At some time during his reign, Herder, Goethe, Schiller, Wieland, Lessing, and Klopstock lived and wrote. Klopstock excelled in lyric poetry. Lessing's plays set a new standard in drama. Goethe and Schiller are the outstanding figures of German literature, and both were eminent in drama and in poetry. Goethe excelled in almost every literary field. In the years following, Heine made his great contribution as a lyric poet. Richter, a great satirist and humorist, was influential during the latter part of the eighteenth and early part of the nineteenth century.

The history of German literature is not complete without mention of its contribution to philosophy. Kant, Fichte, Schelling, and Hegel are known and followed by students of philosophy in all countries.

Outstanding modern dramatists are Hauptmann and Sudermann; and the novelist, Thomas Mann, was a Nobel Prize winner for 1929.

Italian Literature. Because of the hold Latin had upon Italy, nothing of literary importance was written in the native tongue before the thirteenth century. The great poetry of Dante and Petrarch and the perfect prose of Boccaccio made the fourteenth century the Golden Age of Italian literature. Dante Alighieri summarized the Italian thought and feeling of the



NEW LAND, NEW WRITERS, NEW LITERATURE
This is the spirit of American letters, the leaders of which have made themselves world-wide reputations. (1) Poet-philosopher of New England, Ralph Waldo Emerson. (2) Nathaniel Hawthorne. (3) The dreamer, Edgar Allan Poe.

Middle Ages. The modern outlook of Francesco Petrarch showed the intellectual aspirations of the Renaissance. He hoped to be remembered for his Latin writing, but is famous now because of the beauty of his songs and sonnets in Italian. The early Italian humanist, Giovanni Boccaccio, wrote humorous stories which give a picture of Italian life, and his *Decameron* became a model of Italian prose. The sonnet form also came from Italian literature.

Later writers made contributions in various fields. *The Prince,* Machiavelli's book on the art of government, made his name a synonym for treachery in politics. Savonarola wrote sermons, poems, and essays. Ariosto and Tasso were great poets of the sixteenth century. In the seventeenth century Galileo contributed scientific writings. In the eighteenth and nineteenth centuries appeared Alfieri, a writer of tragedy, and Manzoni, the poet and novelist. In later years the historian, Ferrero, and the poets, Carducci and Gabriele d'Annunzio, attained high rank.

These volumes contain biographies of many of the important writers mentioned in this article. See, also, the following titles:

Ballad
Bard
Bible
Blank Verse
Book
Comedy
Drama
Elegy
Epic
Essay
Fable
Fairies
Folklore
Idyl
Legend
Lyric Poetry
Masque
Minstrel
Novel
Ode
Oration
Poet Laureate
Poetry
Skalds
Sonnet
Tragedy

LITH'IUM. Soft and silver-white in luster, lithium is a metallic element something like sodium and potassium. Its symbol in chemistry is *Li.* Its compounds are widely but sparingly distributed. They are found in igneous rocks in very small amounts, and when they disintegrate or decay they find their way into the soil to a slight extent. Lithium is found in traces in the ash of many plants (sugar beet and tobacco) and in milk and blood. Traces are found in water from practically all sources. When the element is present in any notable amount in water, the water is supposed to have medicinal properties. Such mineral waters, called *lithia waters*, are sometimes taken for rheumatism.

Lithium is the lightest solid known, not only floating upon water but upon the kerosene in which it is ordinarily kept from contact with air (in the presence of which it reacts at ordinary temperatures). Its salts are used in medicine. Its carbonate is used in the Edison storage battery. When treated in a flame, most of its compounds turn to vapor and give the flame a crimson color.

LITHOGRAPHY, *lith og' ra fie.* Water and grease do not mix. That fact is the basic principle of lithography, the art of printing from stones. The lithographer uses a fine-grained limestone, the best of which is obtained in Bavaria, Germany. The picture is drawn in reverse, just as reverse type is used by the printer; and it is drawn on the ground or polished surface of the limestone slab with crayon or pen, by the use of a greasy material.

When the drawing is finished, it is washed with a mixture of nitric acid and gum arabic. This mixture keeps the grease from spreading and helps the portions of stone untouched by the crayon to absorb water. When this coating has dried, the stone is washed first with water, then with turpentine, and then with water again. If the drawing is engraved on the stone, a technique similar to engraving on steel or copper is followed.

When the lithographer is ready to print, he sponges the stone surface; the water is absorbed by the untreated stone but does not affect the part covered with grease. Then the ink is applied. It sticks to the greased portion but not to the wet surface. Thus the inked surface reproduces the drawing, which transfers the picture to paper. In modern lithography, either by hand or photographically, the work is done on thin metal, and printing is done on high-speed presses.

Color Lithography. To reproduce a picture in colors, a similar but more elaborate method is followed. The picture is outlined on a master stone, on the margins of which there are registering marks. Then separate stones are prepared for each color to be used; each of these plates or stones must match the registering marks so that colors will not overlap improperly on the final print. Each color is printed separately, usually in the order of yellow, red, light blue, dark blue, pink, gray, and black.

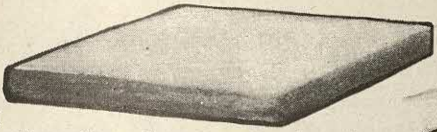
Paintings of the old masters can be reproduced by color lithography with great faithfulness to the original.

LITHUA'NIA. Carved out of Russian territory at the conclusion of World War I, Lithuania is one of the Baltic nations forced to enter the Soviet Union in 1940. It is bounded on the north by Latvia, and on the east, south, and southwest by Russia and Germany. The Lithuanians are a fair-skinned Indo-European people of attractive appearance. The majority are Roman Catholics.

The Land and Its Resources. Lithuania is a land of low, rolling farms. About one fourth of the country is in pastures, one fifth in forests, and nearly half under cultivation. The remainder is waste and unproductive land. Leading the farm products are the small grains—wheat, oats, barley, and rye. Other important crops are buckwheat, flax, and potatoes. Little livestock is raised, but great flocks of geese are bred, largely for their down. The vast estates formerly held by the Russians have been broken up, and today the average farm does not exceed fifty acres.

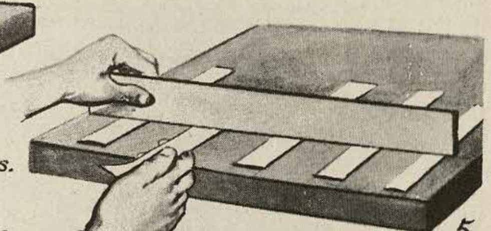
History. The Lithuanian republic of today is only a small part of a grand duchy which was united with Poland in the fourteenth century. In the eighteenth century, when Prussia and Russia divided Poland, the present Lithuania was included in czarist Russia. In 1918 a Lithuanian State Council proclaimed the country's independence, which Russia recognized in 1920. Lithuania was recognized as an independent republic by the powers in 1922. In fixing their boundary lines, the Lithuanians

LITHOGRAPHY is the art of writing and drawing on stone, and, from the stone, producing copies and prints. Grained metal instead of stone is also used.



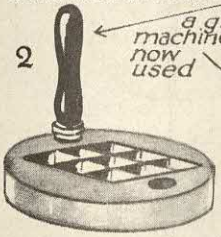
1

Very fine close-grained chalk or marble is used. These stones are obtained from foreign quarries. Before the artist works on it with crayons which contain fat the stone must be ground to a slab of equal thickness. At one time this was done with a Hand Levigator using sand and water; a grinding machine is now used



5

A straight-edge is placed on slips of paper laid on the stone. Any loose slips will reveal hollow places, showing the need for further grinding.



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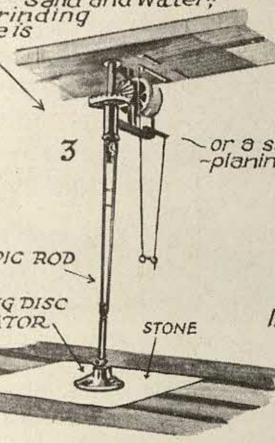
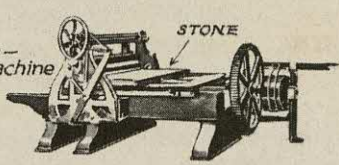


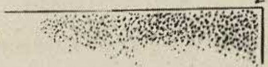
3

—or a stone-planing machine

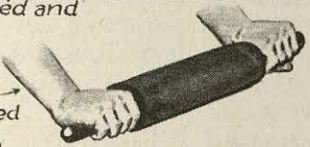


4

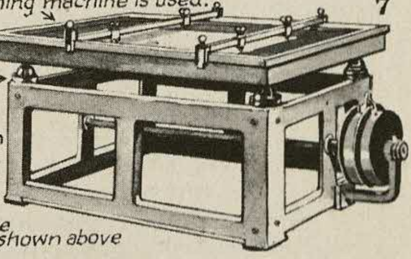
The stone's surface is then burnished with a close-grained slate. If the work is to be of a "grained" kind the polished stone must be sprinkled with fine sand. This is then worked in by rubbing with a big stone, using both hands in circular motions



6 The drawing completed, the stone is etched with acid, inked, washed and covered with gum arabic. When dry this is washed, cleaned with turpentine, rolled with ink again and cleaned with a steel scraper.



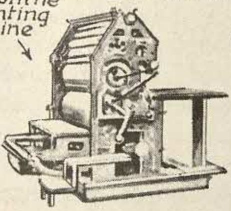
Printing is not often taken from the stone but from metal plates to which the drawing on the stone is transferred. When the drawing is made on metal the surface has to be grained to 'take' the crayon and a plate-graining machine is used.



7

The plate in the trough is covered with balls which are sprinkled with sand and move in the trough. Their motion is similar to the hand motion shown above

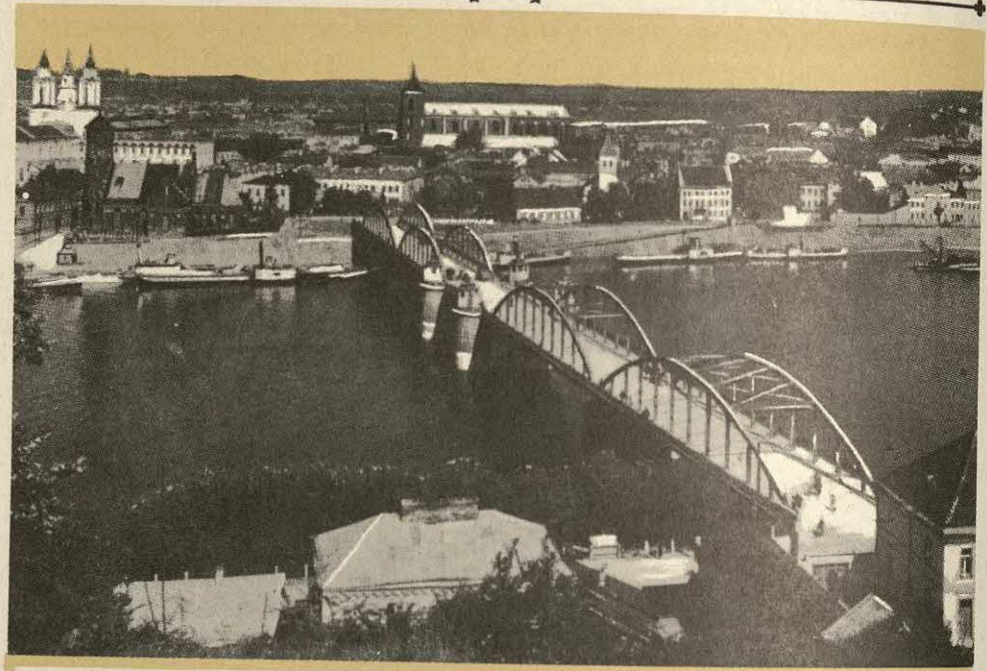
The plates are bent round cylinders and put on the Printing Machine



8

PRINTING PICTURES FROM SLABS OF STONE

Lithography, or chemical-surface printing from stones, was first introduced in 1798. Since that time, the process has undergone many changes. Although reproductions are today generally made photographically on zinc or aluminum and printed from rubber blankets which transfer the ink from these metal plates to the paper or other material, the process is still called lithography or *offset photolithography*, to distinguish it from letterpress and intaglio printing processes. Stones are still used to reproduce fine prints of works by distinguished artists, and in a good deal of colored label and poster work, where they are suited to the size and speed of the run.



ONCE A FREE STATE — NOW A SOVIET REPUBLIC
Lithuania was for many years a part of czarist Russia, but became an independent republic after World War I; in 1940, it was admitted into the Soviet Union. Above, Kaunas, former capital.

had trouble with new Poland, for both countries claimed Vilna province and city. The claim of Poland was upheld by the powers, but Lithuania acquired the German territory of Memelland. The city of Memel, on the Baltic, became a free port.

Lithuania did not recognize the Polish claim until March, 1938, when Poland threatened to invade the country. The area of Lithuania was then 21,489 square miles, and the population was about 2,550,000. Kaunas, then capital, had 108,000 inhabitants. In March, 1939, Adolf Hitler, German Fuehrer, forced Lithuania to cede Memelland (1,099 square miles) back to Germany. In the territorial readjustments following the seizure of Poland in September, Russia ceded to Lithuania her ancient capital of Vilna and surrounding territory, totalling some 2,700 square miles. Lithuania, however, lost thousands of persons of German extraction, who were ordered to migrate to the German Reich. In 1940 she was forced to become a Soviet Republic. The Germans overran Lithuania in 1941, but by the end of 1944 Russia had reconquered the country. The population is about 2,713,000. Vilna, the capital, has about 235,000 inhabitants.

LIT'MUS. If you were to visit a chemical laboratory, you would be sure to notice jars filled with peculiar pink and blue strips of paper. This is litmus paper, made by soaking unglazed paper in a coloring matter obtained from certain lichens found growing on the trees and cliffs of the European seacoasts. Litmus is used for determining the presence of acids or alkalies. The blue paper will change to red when inserted in an acid solution; alkalies turn the red paper blue. This paper may be bought at any drug store, and simple home tests may be made to determine whether sour milk, soda, lime water, vinegar, soil, or even the saliva in the mouth is acid or alkaline. If the solution is neutral, the paper will remain unchanged.

LITTLE ENTENTE, *ahn tahnt'*. During 1920-21, Rumania, Yugoslavia, and Czechoslovakia entered into a political and economic agreement for mutual security. See the articles on these countries.

LITTLE ROCK, ARK. On a fifty-foot bluff above the Arkansas River stands Little Rock, the capital of Arkansas and the county seat of Pulaski County. Located in almost the exact center of the state, it is the state's chief trading, rail, air, busline, and highway center. Its industrial plants include railroad-repair shops; cotton compresses; and flour, feed, and lumber mills. It also manufactures clothing, cottonseed oil, and wood products, including furniture; packs meat; and is a publishing and printing center.

An attractive residential city and educational center, Little Rock is the home of the University of Arkansas medical school and hospital, St. John's Seminary (Catholic), and several colleges for Negroes, including Philander Smith and Arkansas Baptist. Also here are the imposing state capitol, various state hospitals and schools, a United States veterans' hospital, a museum of fine arts, and the Old Arsenal, a military fort and the birthplace of General Douglas MacArthur. The population is about 107,000.

LIV'ER. Weighing three or four pounds, the liver is the largest gland in the body. It is deep red in color, and on the right side is broad, flat, and thick, tapering off to a thin left edge. The liver is suspended in the abdomen by ligaments, and lies just beneath the diaphragm. Its lower surface is divided into two principal lobes, of which the right lobe is the larger.

One of the chief functions of the liver is the conversion of sugars into a starch known as *glycogen*. It also separates waste matter from the blood and secretes bile, which it sends through the hepatic duct to the gall bladder. There the bile is stored until the digestive processes begin. The liver is also one of the body's chief heat producers.

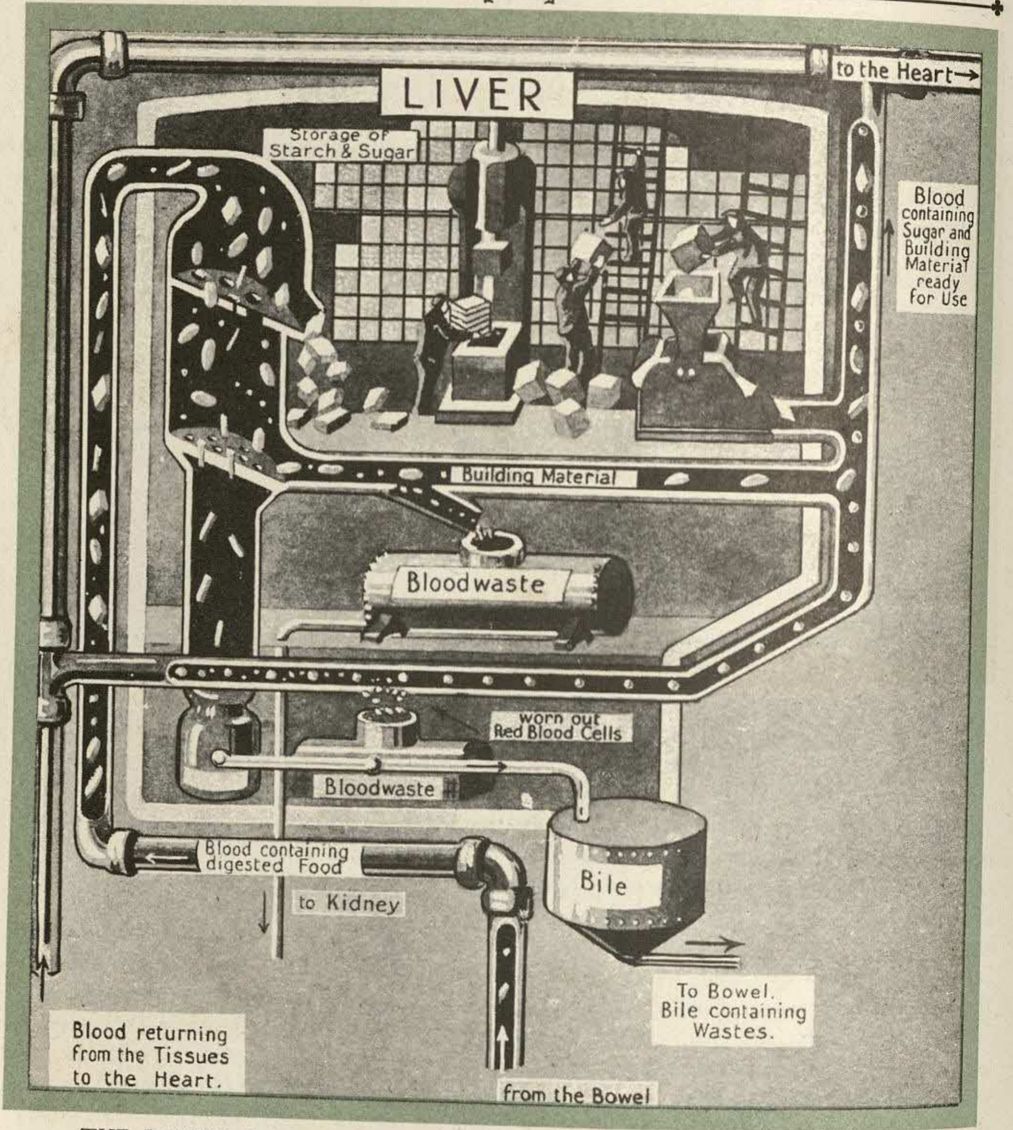
Hog, calf, and beef livers are a valuable food, and extracts of these organs are often given as a cure for anemia. See CIRCULATION; DIGESTION.

LIV'ERPOOL, ENGLAND. One of the world's great commercial and trading centers, Liverpool is second only to London among the ports of Great Britain. Built on a bend of the Mersey River three miles from its mouth, Liverpool is located in northwestern England, some 200 miles from London and thirty-two miles from the great cotton-manufacturing city of Manchester, with which it is connected by a canal. Liverpool handles more English exports than does London, and much of the cotton, grain, flour, wool, meats, hides and skins, and other raw materials and foodstuffs that are imported.

The city's chief point of interest is the line of docks stretching along its semicircular waterfront for some seven miles, and the huge grain elevators, warehouses, cold-storage plants, and oil tanks standing nearby. Most of the passenger ships visiting the harbor load and unload at its long, floating wharf, or "landing stage," which is supported by pontoon boats. "Lock docks" protect ships from the unusually high tides rushing in from the Irish Sea. Liverpool also makes flour, cotton goods, and other products, is the hub of the great surrounding industrial and shipbuilding center called Merseyside, and is an important center of rail, air, and highway transportation.

Rising upward from the harbor, the city is noted for its fine St. George's Hall (used for public meetings and educational purposes), its town hall, begun in 1754, its huge cathedral, and its Walker Art Gallery, Picton Lecture Hall and Library, and University of Liverpool. The city, which owns most of its public utilities, was frequently bombed by German planes during World War II. England's third-largest city, it has about 770,000 residents. See MANCHESTER.

LIVINGSTONE, *liv' ing stun,* DAVID (1813-1873). The greatest figure in the dramatic story of African exploration was


LIVER
to the Heart→
Storage of Starch & Sugar
Blood containing Sugar and Building Material ready for Use
Building Material
Bloodwaste
worn out Red Blood Cells
Bloodwaste
Blood containing digested Food
to Kidney
Bile
To Bowel. Bile containing Wastes.
Blood returning from the Tissues to the Heart.
from the Bowel

THE BODY'S COMBINATION STOREHOUSE AND FILTERING PLANT

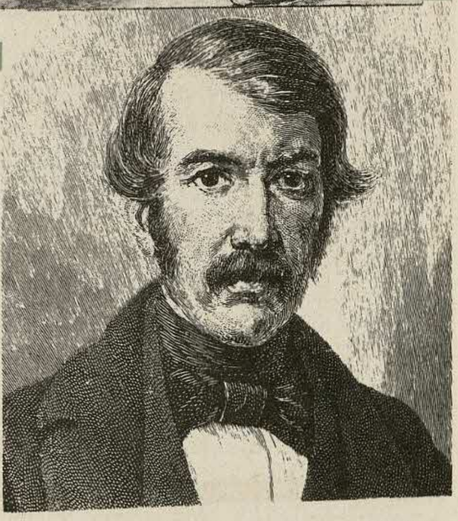
The liver is a remarkable gland whose chief duty is the storage and proper distribution of nourishing material. It also produces the essential bile and discards wastes.

David Livingstone, the Scottish medical missionary who devoted more than thirty years of his life to pioneering on the Dark Continent.

The explorer was born at Blantyre Works, Scotland, and received a medical education in Glasgow. At the age of twenty-seven he went to South Africa as a medical missionary under the auspices of the London Missionary Society. He first worked with the explorer Robert Moffat at Kuruman, Bechuanaland. He remained at this station for two years, and then set up a station at Mabotsa, 200 miles northeast. He soon married Moffat's daughter Mary, and brought her to Mabotsa in 1844.

Livingstone learned from the natives that there was a lake north of the Kalahari Desert, and so set forth to find it. This lake is now known as Lake Ngami. In 1852

WILDERNESS ENCOUNTER
The meeting in Africa of the great missionary, David Livingstone, and Henry M. Stanley of the New York *Herald* was world news then. Livingstone (right) was believed lost.



he set out through the upper lake region of the Zambezi River territory, on his way to the Atlantic coast. Two years later he returned and followed the Zambezi to its outlet in the Indian Ocean, thus crossing the continent completely. This journey was some 2,000 miles, and Livingstone made it almost entirely on foot. He reported this journey in his book *Missionary Travels and Researches in South Africa.*

In 1858 Livingstone was given the command of an expedition to explore the eastern and central regions of Africa. He explored the region along the river Shire and Lake Nyasa and returned to England in 1864. The next year he decided to settle the question of the sources of the Nile. For years he trekked through the region west of Lake Nyasa, exploring lakes Mweru and Tanganyika, and during that time no news of his whereabouts reached the world. James Gordon Bennett of the New York *Herald* sent Henry M. Stanley to find him, and their meeting at Ujiji on the eastern shore of Lake Tanganyika in 1871 is a famous incident in African history. The two parted in 1872. A year later the hardships of pioneering proved too much for Livingstone and he died at Lake Bangweolo. The natives carried his body to Zanzibar. Later it was taken to London, and buried in Westminster Abbey.

Of Livingstone's books perhaps the best known are *The Zambezi and Its Tributaries* and the *Last Journals.* See AFRICA; STANLEY, HENRY M.

U.S. Fish and Wildlife Service

COLD-BLOODED LIZARDS LIVE WHERE IT'S HOT
Chuckwalla (above) enjoys desert heat. Regal horned toad and young (below) sunbathe in sand.

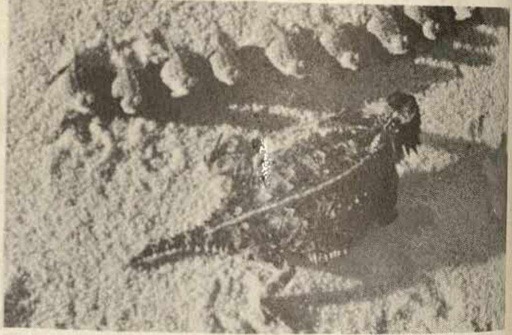
LIVO'NIA, once a Russian province, is now in Latvia and Estonia. See LATVIA.

LIVRE, *lē' v'r.* Before 1795, the livre was an important French coin. At that time it was replaced by the franc, of about the same value. See FRANC.

LIV'Y (59 B. C.-A. D. 17). The outstanding historian of the Roman Empire during the Augustan Age was Titus Livius, now known as Livy. He was one of the few historians who admitted that his point of view was definitely patriotic rather than critical; but while he glossed over the social evils of the day, on the whole he aimed at the truth.

Little is known of the historian's life. He was born at Patavium (Padua), had an important position at the court of Augustus in Rome, was married, and had at least two children. He died in his native city. During this life, he wrote a history of Rome in 142 books, of which we have thirty five and the tables of contents of all the others except two. The extant parts are one of the most important sources of our knowledge of this period.

LIZ'ARD. To many people, any long, narrow, four-legged creature which drags its body along on the ground and has a well-developed tail is a lizard. For this reason, many people apply the name to salamanders. Lizards belong to the group of reptiles and have scale-covered bodies, while salamanders are smooth-skinned amphibians (see SALAMANDER). Not all lizards have four legs. For example, glass snakes, which are lizards, have none. These creatures look like snakes but, unlike snakes, have eyelids. In North America, lizards are most common in Southwestern United States and regions southward. For the most part, these lizards prefer dry, hot country.



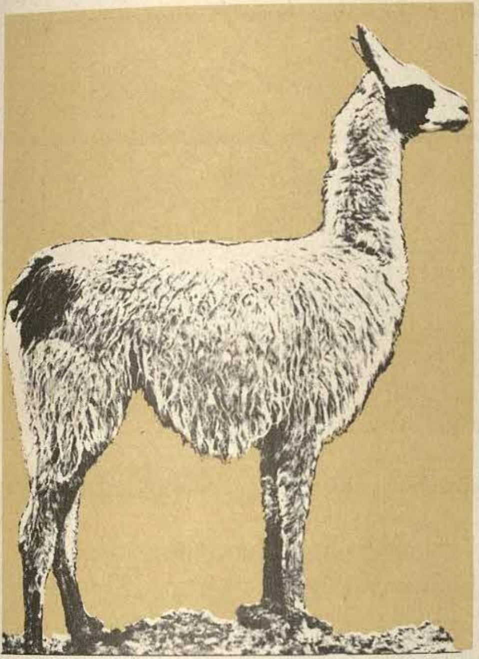
Sharon Proctor

Some lizards live in trees, some on the ground, and some underground. Among the best-known lizards are the *horned toads,* the *swifts,* the *chameleons,* the *glass snakes,* the *Gila monsters,* the *iguanas,* and the *dragons of Komodo.*

Most lizards lay thin-shelled eggs. Some give birth to living young. Most species feed upon animal matter, although some live only on plants. There are about 2,500 species of lizards.

Consult the following articles for descriptions of different lizards:

Chameleon
Gila Monster
Horned Toad
Iguana



ANDES "CAMELS"
The llama is a valuable beast of burden in the South American mountain regions.

LLAMA, *lah'ma.* Few animals have been of more general use to the people of South America than llamas. These animals, and the alpacas from whose wool alpaca cloth is made (see ALPACA), were probably developed from the guanacos, which are still wild in the southern continent.

Llamas are closely related to camels. They carry their heads well back, as camels do, but lack the well-known humps. They have beautiful eyes but their teeth are surprising. Instead of being covered by the lips, the teeth of llamas stick almost straight out. Llamas are about five feet high from their ears to the ground. They measure about three feet high at the shoulder.

Llamas are very useful. The males are used as beasts of burden in the high mountainous country of South America. Each llama can carry a load of 100 pounds over trails which horses could not travel safely. They can travel only about twelve miles a day, because they will not eat at night. Their food is largely forage crops. The females furnish excellent flesh and milk for food. The fleece of llamas is valuable in making cloth and the hides in making leather.

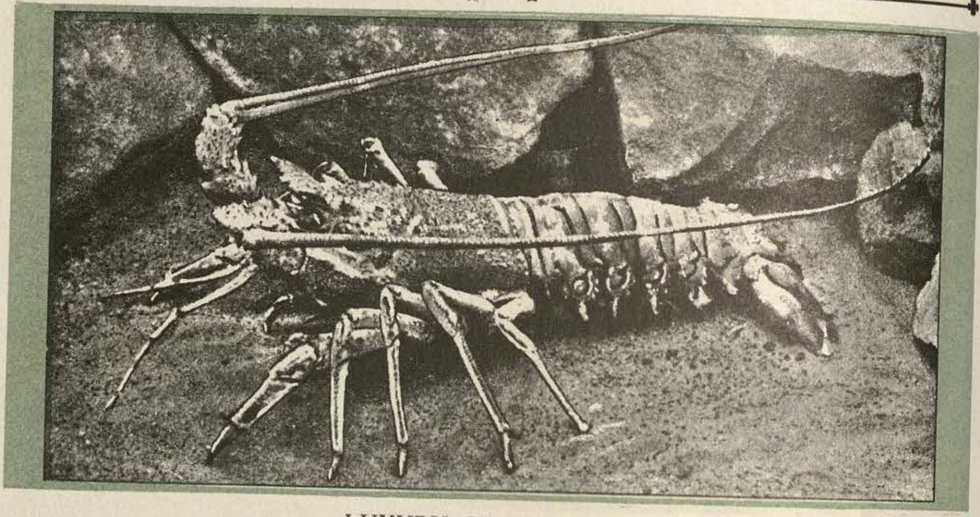
LLANOS, *lyah'nose.* Lying in Colombia and in the Orinoco Valley in Northern South America are vast plains known to the early Spaniards as *llanos.* During the dry season these areas burn almost to a crisp, while in the rainy season they are flooded. Between seasons, they are excellent grazing land for great herds of horses and cattle. In Northern Argentina such plains are called *pampas.*

LLOYD'S, *loidz.* Starting from a smoke-filled, seventeenth-century coffeehouse, Lloyd's of London, as it is called, has grown to be the world's most famous association of insurance underwriters. The insurance men used to meet in the restaurant of Edward Lloyd primarily to place odds on the security of shipping. Most modern lines now insure with Lloyd's. The organization does *not* issue insurance policies but maintains agreements with insurance companies and guarantees or underwrites the risk. Today Lloyd's will give rates on practically anything.

LOAM, *lome.* Any soil of intermediate texture is known as loam. Usually it is mellow, working well under the plow. It is composed of a mixture of chalk, clay, sand, and humus. The finest loam in the United States is silt loam, a medium-textured loam of unusual richness. This type of soil is found principally in the Corn Belt.

LOBBY AND LOBBYING. Those who seek by persuasion, by personal influence, by wiles, or by bribery to influence legislators in the adoption of favorable laws are engaged in lobbying and are called lobbyists. A particular group is called a lobby, as a "public-utilities lobby" or a "labor lobby."

Misuse of the lobbying privilege has brought about the enactment of laws to control lobbies at Washington. It is the privilege of anyone, however, to promote legislation he desires, or to protest any proposed law which is objectionable to him.



LUXURY CRUSTACEAN
The tender, white meat of the lobster is esteemed as a great table delicacy.

The term arose from the frequenting of lobbies and corridors of capitol buildings by persons seeking to influence the votes of legislators on certain bills. Lobbying has developed into a business, and many blocs or associations of manufacturers, farmers, laborers, former soldiers, merchants, munitions makers, peace advocates, and similar groups employ regular lobbies to seek legislation favorable to their interests.

So long as argument and reason are the weapons of the lobbyist, he is within his legal rights, but many lobbyists by bribery and coercion have brought discredit upon themselves and their interests..

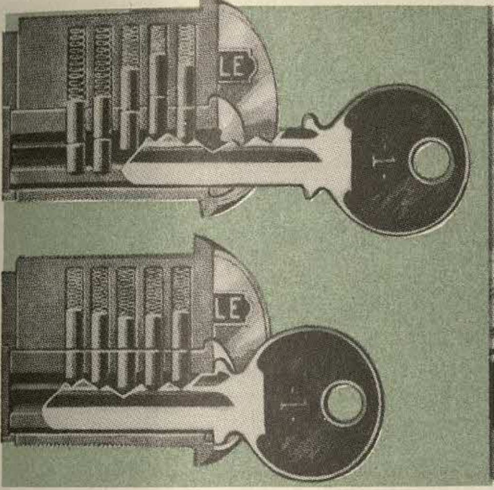
LOBE'LIA. The most interesting fact about the flowering herb, the lobelia, is that it is more beautiful in a wild state than under cultivation. One popular species is a brilliant red, another a bright blue. Lobelias are widely distributed over the world, and about thirty species are found in the United States. Several tropical species are cultivated in hothouses. All lobelias are somewhat poisonous.

LOB'STER. One of the largest of the crustaceans, or hard-shelled sea animals, is the lobster, a relative of the crawfish, the crab, and the shrimp. Lobsters may grow to be two feet in length and have been known to weigh as much as thirty pounds. Those of average size, however, weigh from one to two and one-half pounds.

The lobster has a segmented body, two pairs of antennae, six pairs of organs in the mouth, two large eyes at the end of thick stalks, and four pairs of walking legs. In addition, it has a pair of heavy, pincer-like claws near the front of the body. Lobsters are greenish when alive; they turn into the familiar red when they are boiled.

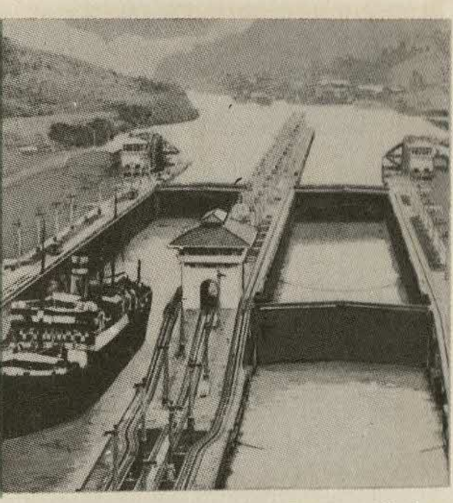
Lobsters live on the bottom of the sea, usually in shallow water and usually where the bottom is rocky. They walk about on the tips of their walking legs, and they can swim backward. Their large front claws enable them to fight their enemies and one another. When lobsters molt, or change their shells, their entire bodies are soft; and the animals must hide to escape unfriendly fish and other lobsters. Like the crawfish, the female lobsters carry their eggs until they hatch. For several weeks the young lobsters swim about on the surface and then descend to the bottom to live like other lobsters.

Lobster is a popular food, and for this reason lobster fishing is an important industry. In North America the most important lobster fisheries are on the Atlantic



Courtesy Popular Mechanics

THE RIGHT COMBINATION
The notches on the key match pins in lock.



Corps of Engineers, U.S. Army

STAIRWAYS FOR SHIPPING
Locks in canals raise or lower ships and barges.

coast from Labrador to Delaware. Millions of pounds of fresh and canned lobster are consumed every year. Because lobsters have been threatened with extermination, coastal states have undertaken to limit the catch and also to raise lobsters in hatcheries.

LOCK. The guardians of private property for hundreds of years, locks remain the principal means of fastening doors, chests, drawers, and containers of every kind. They are developments of the simple bolt, their advantage lying in the fact that they may be worked from both sides of a door, or from outside a container, with a key.

Most locks work according to a simple principle. They contain a *bolt,* a *staple,* and a *spring.* The bolt is the moving block which actually catches the door. The staple receives the bolt, and the spring prevents opening without a key. The key is inserted in the lock, and its patterned edge fits against a tumbler of the same pattern. The tumbler moves and releases the bolt, which shifts sideways when the key is turned. Most locks have three or more of these tumblers, and they must all fall to a single level to permit the bolt to move. The key's pattern forces them to this level.

This type of simple lock was once the only known kind, but at present most doors are locked with Yale locks, named after their inventor, Linus Yale. These consist of a horizontal cylinder controlling the bolt. Within this is a row of little pins, opposite a similar row mounted in the frame of the lock. The pins are pressed together with springs, and each is of a different length. The key is inserted above the cylinder, and its irregular pattern forces the uneven pins to line up, thus freeing the cylinder.

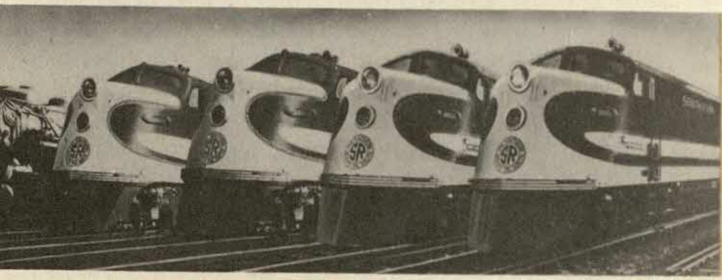
LOCK. A device used in canals or rivers to raise or lower ships from one level to another is the lock. Ship canals, except those in a perfectly flat country, would be useless without locks.

A lock is a concrete section, closed by gates, or *leaves,* at both ends. Usually the gates are V-shaped when closed, with the apex pointing upstream to withstand any pressure. When a ship is to be raised, the gates of the lock at the low-water end are opened, and the craft goes into the section. Then the gate is closed. By the use of valves in the upper gates or in the sides or bottom of the enclosure, water is allowed to run into the closed lock. Gradually the water in the lock rises to the level of the high water. The high-water, or upper, gate of the lock is then opened, and the ship floats out. When a boat is to be lowered, it enters at the upper end, and the water is allowed to run out of the lock until it is level with the low water. In big locks, the valves and gates are operated by machinery. See CANAL; PANAMA CANAL.

LOCKE, JOHN (1632-1704). A doctor of medicine who decided to take up philosophy, John Locke ranks among the greatest of English thinkers. He is best known for his theory that experience is the only source of a man's ideas—that no ideas whatever are inborn.

Locke was born at Wrington, in Somersetshire, and attended Westminster School and Christ Church College, Oxford, later studying for the medical profession. He became secretary to the Earl of Shaftesbury, and at the request of the latter drew up a constitution for the Carolinas, Shaftesbury being one of the proprietors. This document, called the Grand Model, failed because it was based on feudalism, a system impractical in the new country. Some years later, Locke published the book containing his philosophical ideas, under the title *Essay Concerning Human Understanding*.

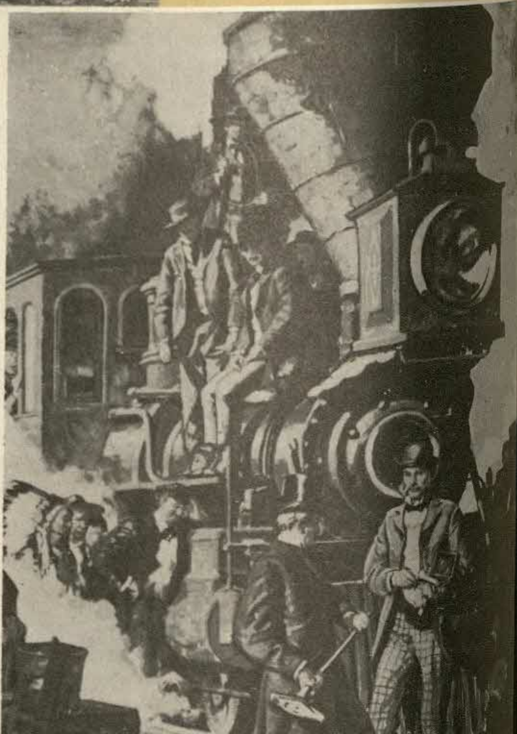
LOCK'OUT. When an employer declares a strike, refusing to let his employes continue to work, the practice is called a lockout. It may occur after the workingmen have submitted demands which the employer will not grant, preferring to close his place of business for the time being rather than to make the concessions. See LABOR ORGANIZATIONS; STRIKE.



Southern Railway System; Dean Cornwell — House of Seagram

PROGRESS ON THE RAILS

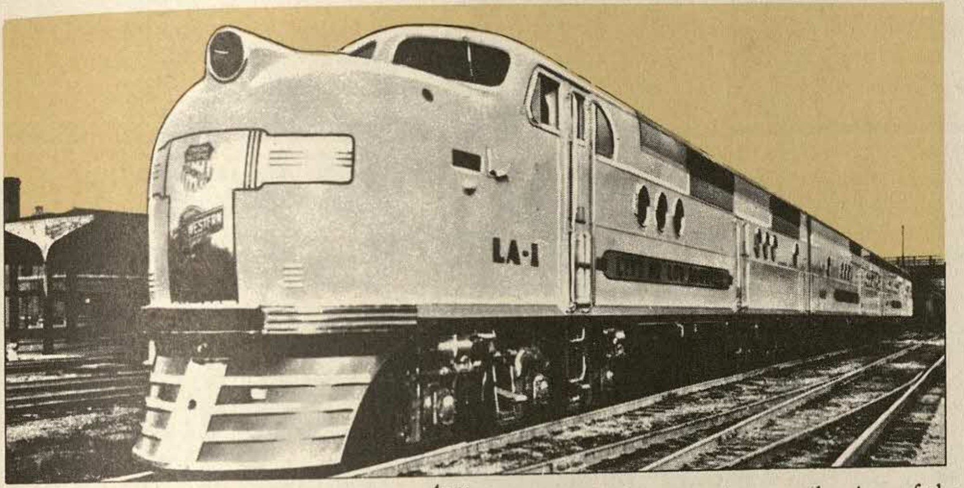
The old "Iron Horse" (below) would be no match for the fast, powerful steam and Diesel locomotives that travel the rails today.



LOCOMOTIVE, *lo ḳo mo'tive.* Despite the advent of swifter and cheaper transportation, the powerful, puffing mechanical giant that charges along steel rails is still man's greatest mover of people and goods. It is true that the airplane surpasses the locomotive in speed and that the automobile enables people to travel cheaply; but the "iron horse" is still the monarch of transportation and, for general purposes, probably will continue to be king.

In its 100-odd years of life, the locomotive has been both messenger and master of men, the means by which men have communicated with one another and have supplied one another's needs. It is one of the keystones of modern society and certainly the basis of the vast railroad industry which plays an important part in civilization.

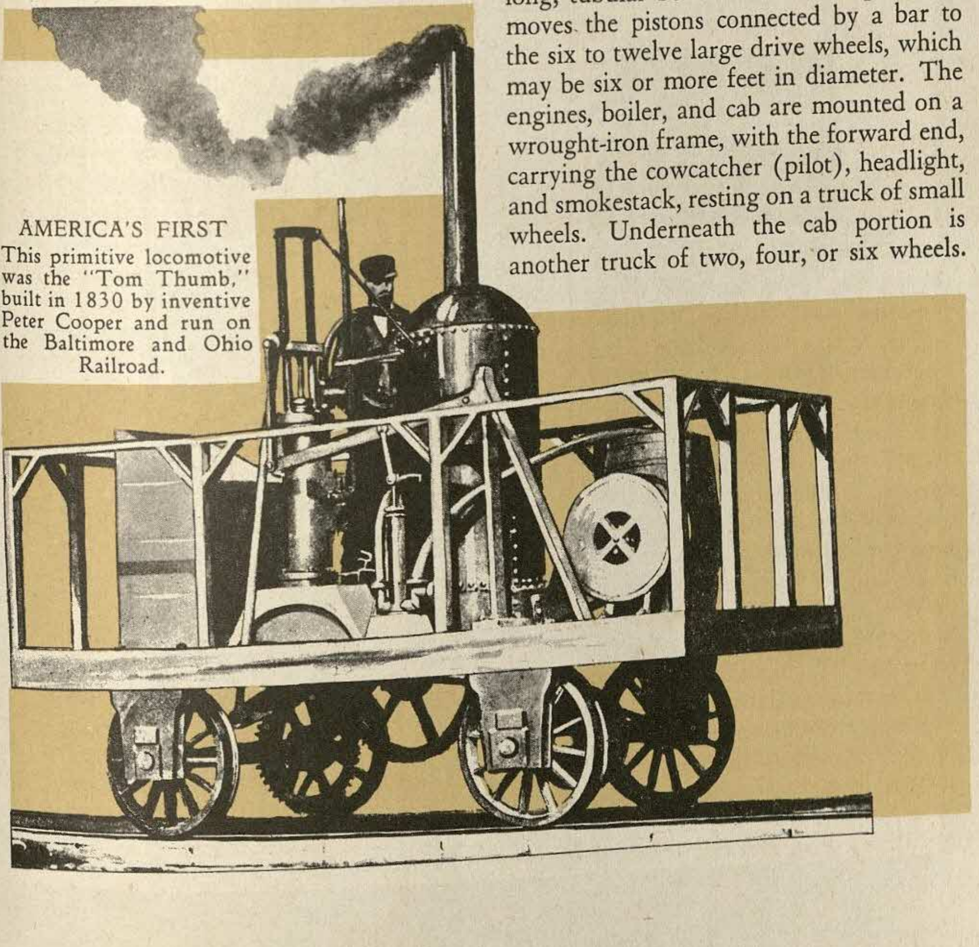
Hardly a person, old or young, fails to



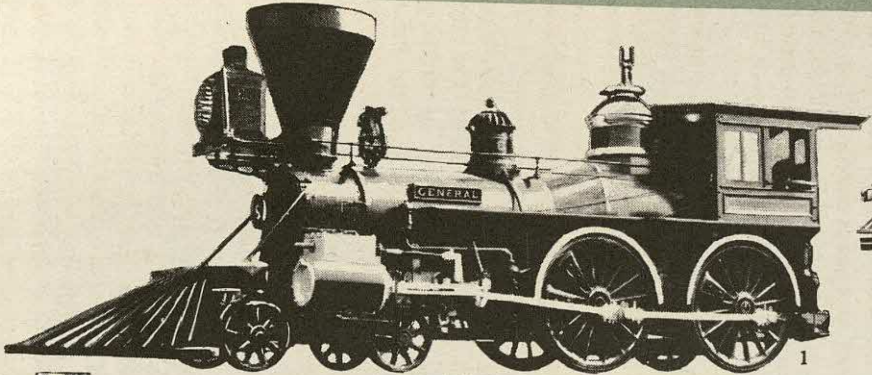
Acme

A RIVAL FOR THE "IRON HORSE"
Now gliding over the rails behind the muffled thunder of the mighty Diesel are serpentine streamliners like the *City of Los Angeles.*

wonder at the marvelous mechanism of the steam locomotive, the "iron horse" that weighs from 60 to 500 tons. Coal or oil is used for fuel to heat the water in the long, tubular boiler. The steam produced moves the pistons connected by a bar to the six to twelve large drive wheels, which may be six or more feet in diameter. The engines, boiler, and cab are mounted on a wrought-iron frame, with the forward end, carrying the cowcatcher (pilot), headlight, and smokestack, resting on a truck of small wheels. Underneath the cab portion is another truck of two, four, or six wheels.



AMERICA'S FIRST
This primitive locomotive was the "Tom Thumb," built in 1830 by inventive Peter Cooper and run on the Baltimore and Ohio Railroad.



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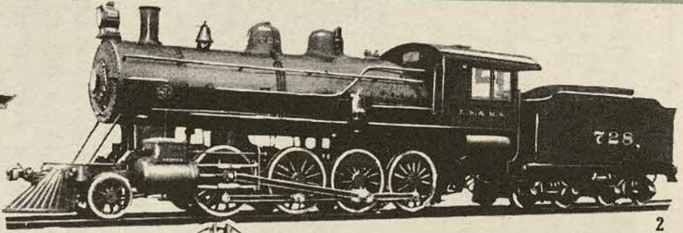

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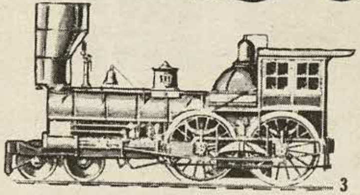
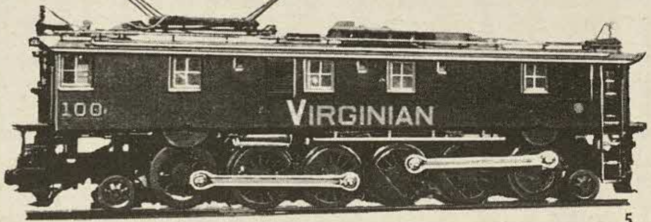
(1, 2, 5, 6)
Courtesy Association of American Railroads
(4) Courtesy Popular Mechanics



3

WHISTLE	INDICATION
o	APPLY BRAKES. STOP.
–ooo	FLAGMAN PROTECT REAR OF TRAIN.
––––	RECALL FLAGMAN FROM WEST OR SOUTH.
–––––	RECALL FLAGMAN FROM EAST OR NORTH.
oo	ACKNOWLEDGING SIGNAL.
ooo	BACK-UP TRAIN.
––oo	GRADE CROSSING WARNING.

4



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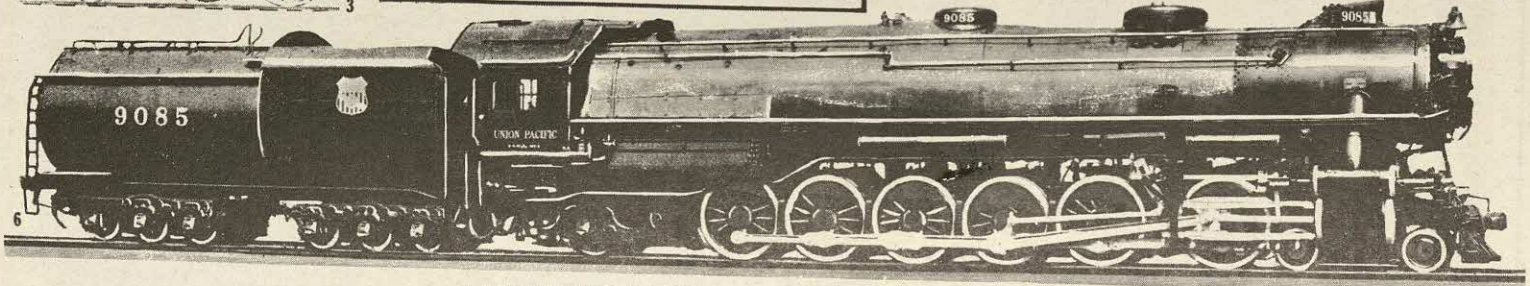


6

LOCOMOTIVES THAT HELPED A NATION GROW

Such locomotives as these were the key that opened a continent for settlement, agriculture, and industry. Without them there would be no modern United States, for they united the country and, within a few decades, became a national necessity. Here are a few of the locomotives developed in the first hundred years of railroad history: (1) A locomotive of the 1860's. (2) An "Iron Horse" of 1905. (3) A passenger train engine of 1851. (4) Whistle signal code. (5) An electric-powered locomotive. (6) A steam-powered, heavy-duty freight locomotive.

The tender, which carries the fuel, is hooked to the rear of the locomotive and is mounted on two trucks of four or six wheels each.

In the cab is a myriad of gauges, levers, and handles by which the engineer and fireman control the locomotive. Here the engineer sits at the side, where he may see the track ahead of him. The levers are within easy reach, and it is a simple matter for him to increase the speed by opening the steam valve, to apply the air brakes, to ring the bell, or to blow the whistle.

Just as wonderful are the Diesel-powered and electric locomotives. Competition provided by the airplane and automobile has resulted in high-speed, streamline locomotives, some powered by steam, but encased in sleek, shiny steel-alloy bodies that reduce weight and wind resistance; and others powered by Diesel engines capable of great speed and far lighter than the usual steam engine. These Diesel-powered, streamlined trains use less fuel and go faster than do the heavier trains; yet they do not depend on outside power such as a third rail. They are operated from a cab at the front of the locomotive; there is no need for a tender, or coal car. Electric locomotives have been in service for many years.

The locomotive came into being because some sort of power was needed to haul coal from English mines to the docks on the coast. It was invented about 1803 by a Cornish miner, Richard Trevithick, but it did not come into general service until 1829, when George Stephenson, an English engineer, built the *Rocket*. This quaint engine, which had a boiler six feet long, a tall smokestack, and four wheels, could haul a load of nine tons twenty miles an hour and was capable of a speed of thirty miles an hour. In 1830 the *Peter Cooper*, the first American locomotive, was built; and since then great improvements have been made. The trend has been to lengthen the boiler, add wheels, and shorten the smokestack.

It is interesting to remember that the first locomotives were considered "crimes" because of their "great" speed, noise, and smoke. In fact, it was required by law that a man on horseback precede the locomotive, waving a red flag to warn the people of the approaching "danger."

For additional information, consult the following articles:

Air Brake
Diesel Engine
Electric Railway
Railroad
Steam
Steam Engine
Stephenson, George
Transportation
Westinghouse, George

LOCO, *lo′ko,* **WEED.** Throughout the great Western and Southwestern cattle country of the United States, a continual battle must be waged against the loco weed, a troublesome member of the pea family. The weed is so named because loco in Spanish means *crazy,* and horses or cattle which have eaten the weed are subject to strange actions. Animals feeding upon loco weed become dazed, weak, and clumsy, unable to step over small obstacles without stumbling Their sight is impaired, they lose weight, and eventually they refuse to eat and die of starvation.

Locoed cattle and horses are ordinarily removed from the range, given a "shot" of strychnine, and usually recover. Locoed sheep are seldom cured. The three important types of loco weed are *white* loco, *purple* loco, and *blue* loco. The loco weed is sometimes called "crazy weed."

LO′CUST. Any of the common short-horned grasshoppers are locusts. The name is so used in the Bible and in any books in the English language written outside the United States. Unfortunately, Americans have given the name to the members of the cicada family (see CICADA); and another source of confusion arises from the fact that the scientific name *Locustidae* is given to the group of long-horned grasshoppers, including the katydid, while the true locusts belong to the family *Acrididae.*

Locusts have done more direct injury to mankind than any other family of insects. This statement is especially true of the migratory forms which appear sometimes as veritable plagues. Locusts have totally destroyed crops over large areas and have been the direct cause of famines costing hundreds of thousands of lives in one region in a single year, not only once but many times in the history of man. See GRASSHOPPER.

LOCUST. Characteristic podlike fruits mark the interesting group of locust trees as members of the pulse family of leguminous plants.

Sharp prickles or coarse thorns grow on their trunks and twigs, a fact soon evident to anyone who touches them. It is said that the early settlers in the West used trunks of honey locusts in the barricades they built around their dwellings. It would be a fearless Indian indeed who would try to plunge through such a "barbed-wire entanglement."

There are several species of locusts in North America, including the *honey, water, black,* or *yellow,* locusts, and the *false acacia.* Heavy and hard, locust wood is used for fence posts, ties, and other construction. The water and honey locusts belong to a different genus from the other species named. See HONEY LOCUST.

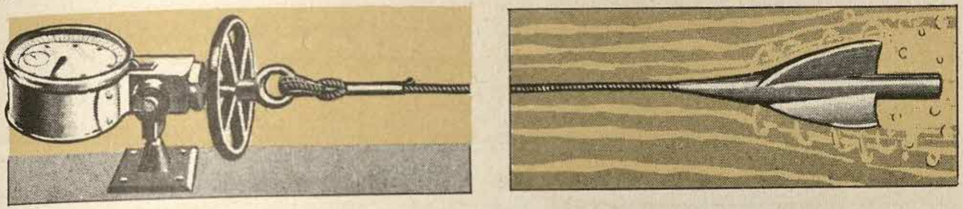
LOESS, *lo'es.* A fine deposit of soil laid down by the wind, loess occurs in many parts of the world, particularly in China, in Northern Europe, and in the United States. In China this deposit is very extensive. It occurs largely in the neighborhood of the Hwang Ho, where it is sometimes 1,500 feet deep. It has the peculiar property of standing in vertical walls when cut through, so that caves may be dug into it. Thousands of Chinese live in cave homes cut in loess.

NOISY PLAGUE

Few insects do so much damage to crops as does the seventeen-year locust, which eats everything.

In the United States, loess deposit is found mainly along the Missouri, Mississippi, and Ohio rivers, where it occupies the uplands back from the river bottoms. Most of it was deposited immediately following the Ice Age. The streams flowing from the melting ice carried great quantities of ice-formed rock powder into these larger streams, and this was deposited along the broad bottoms. After the ice disappeared and these streams became less swollen, this rock powder was left exposed. It was picked up by the wind and carried out over the adjoining uplands, which it covered to varying depths. During the years which have followed, this material has weathered into very fertile soil.

LOFO'TEN, or LOFO'DEN, ISLANDS. Located within the Arctic Circle, the Lofoten Islands, important fishing grounds for cod and herring, lie off the northwest coast of Norway and are a part of that country. Nearly 30,000 fishermen are engaged in and about these mountainous, unproductive islands during the season, which is from December to March. Navigation is often difficult because of the narrow channels and treacherous currents, and the



HOW FAST IS THE SHIP GOING? HOW FAR HAS IT GONE? THE LOG TELLS.

Maelstrom whirlpool at the south end of the islands is dreaded by all fishermen. The population of the islands is about 40,000.

LOG. When the navigator of a vessel desires to know the distance the ship is making through the water, he makes use of a mechanical device known as the log. A line, to which is attached a drag with fins, is trailed behind the ship; and the forward motion of the ship causes the fins to rotate, recording upon a special meter the number of revolutions made and the distance covered. This information may be transmitted electrically and be automatically recorded in the chart house, giving a permanent graph of the ship's progress. Because the recording mechanism is attached to the taffrail (at the stern), the log described above is called the *taffrail* log.

The log book contains the official record of the speed, course followed, weather, and important happenings of each voyage, and is usually recorded hourly.

LO′GANBERRY. Named for its discoverer, Judge J. H. Logan, the loganberry was formerly believed to be a cross between the blackberry and the raspberry. It is now thought to be a variety of the trailing blackberry. It is a purplish-red fruit, very sweet to the taste, and is often used for wines, pastries, jams, and juices. Widely cultivated along the Pacific coast of North America, the loganberry can be grown only in mild climates.

LOGARITHM, *log′ a rith′m.* Although arithmetic is commonly considered our simplest form of mathematics, an engineer or astronomer or an accountant would be dismayed if he had to work out a long problem involving the multiplication and division of large numbers without a table of logarithms. With such a table, the calculation of the longest and most complicated products and quotients may be transformed into amazingly simple operations of addition and subtraction.

As soon as students of second-year algebra learn how to handle *exponents,* they are taught the use of logarithms. For logarithms are exponents, and the laws of exponents explain immediately why logarithms can reduce all arithmetic to mere sums and differences. It will then be easy to see why, when we wish to multiply large numbers, we can instead add their logarithms; when we wish to divide, we can subtract the logarithms.

Logarithms were invented early in the seventeenth century by John Napier of Scotland and Joost Bürgi of Switzerland, working independently of each other. The value of logarithms in mathematics was not realized until several years later, however. Two kinds of logarithms are now employed. *Briggsian,* or *common,* logarithms, worked out by Henry Briggs with the help of Napier, are those which simplify computation. The other type, the *Napierian,* or *natural,* logarithm, the work of Napier alone, but having a different basis from the Briggsian, is used as a convenience in higher mathematical analysis.

LOGIC, *loj′iḳ.* Psychologists have discovered that the human mind is prone to jump to conclusions. People argue, as a rule, according to feelings and emotions, instead of attempting to reason soundly from carefully ascertained facts.

The science of sound reasoning is known as logic. In what is known as *formal* logic, it is a very carefully worked-out system, founded by ancient Greek and Roman philosophers, and built up in the centuries since. Formerly, all boys and girls who went to school used to study its rules and symbols and do exercises in it, as they do now in algebra. But it is not necessary for us to understand formal logic in order to be reasonably logical in our everyday thought. Knowledge of a few of the simplest rules is helpful, and a little common sense and plain thinking will do the rest.

First of all, it is well to remember that in any argument there are two chances for error: one in the facts on which we base our reasoning, the other in the reasoning itself. Secondly, we should remember not to draw conclusions from insufficient data. It is a common fallacy (error in reasoning) to conclude, for instance, that because one event happens after another, the second is caused by the first. In Rostand's play, *Chantecler,* the rooster thinks that his daily crowing brings on the dawn. And a good many of us are chanticleers. Another way of reasoning from insufficient knowledge is to assume that all the members of a group are like the one member we have seen.

LOIRE, *lwahr.* The longest river in the country, the Loire is an important part of the network of canals and river systems forming the trade routes of Southern France. Navigable to a certain extent for 490 miles of its total length of about 620 miles, the river rises in the Cevennes and flows north and then west into the Bay of Biscay.

LOKI, *lo'ke.* Mischievous and wicked, Loki was an evil god in the Norse legends. Handsome and fascinating, he was clever, sometimes embarrassing the other gods and usually being associated with plots. He was the father of Hel, goddess of the dead.

LOM'BARDS. From the sixth to the eighth century, Northern Italy was under the control of the Lombards, a Germanic people who had moved south from the Elbe in the year 568 under King Albion. They received their name from either the long *bartes,* or spears, they carried or from the long beards they wore. Their kingdom was called Lombardy and grew in power until it held sway over all Italy from 713 to 744. Sometime before, they had been converted to Christianity by Theodelinda, a Frankish princess who had married King Authari. The Lombards drew up a system of laws under King Rothari, which for many years was the foundation for Germanic law. The Lombard kingdom came to an end in 774 when Charlemagne conquered the country.

LOMBARDY, *lom'burd y.* In Northern Italy is a province called Lombardy, named after the ancient Lombard kingdom. Here are located two of Northern Italy's most important cities, Mantua and Milan. The population of Lombardy is over 6,500,000. See LOMBARDS.

"BIG BEN" SYMBOL OF LONDON
Teeming capital of British Commonwealth.

LONDON, *lun'don,* ENGLAND. Spreading over a vast area from both banks of the Thames River is the greatest concentration of people, wealth, and commerce known to history. It is London, capital of the British Commonwealth and center of the English-speaking world. London is the hub of international commerce, and it probably has a more influential part in shaping the destinies of world affairs than does any other capital. It is an ancient city, having its beginnings in a small settlement that grew up around a bridge built by the early British tribes at a spot on the Thames River where it ceases to be navigable.

From its start as a small settlement, London has spread out in all directions, absorbing many other towns. The heart of London, called "the City," is on the north bank of the Thames; its area is little more than a square mile. It is only a place of work, and every day nearly half a million people pour into it to transact the business of the empire. Here are located large banks and the headquarters of industrial concerns. It has a population of about 20,000. The City has its own government, headed by the Lord Mayor of London.

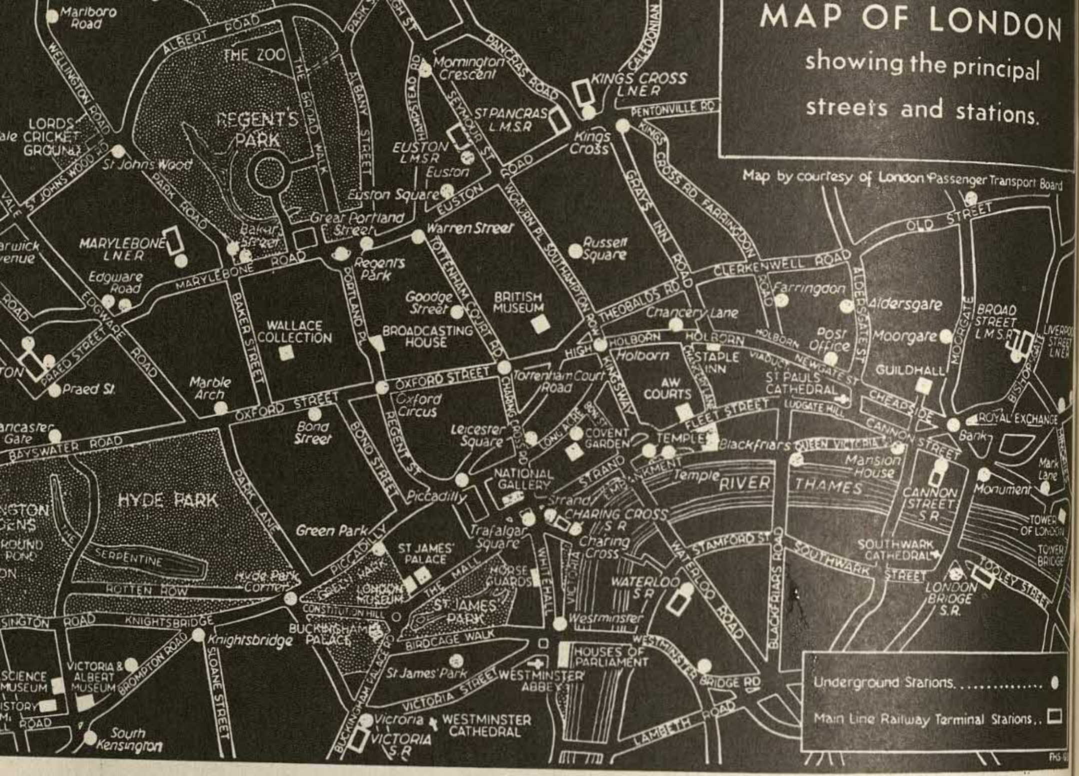
COMMERCE VS. TRADITION

London is an odd yet fascinating mixture of the two. Left, bustling Thames docks, with Tower Bridge in the background. Below, Buckingham Palace Guard.

The County of London, of which the City is a part, has an area of 118 square miles and a population of about 3,225,000. There is a third London which, including what is known as the "outer ring," is called Greater London. Constituting one of the largest metropolitan centers of the world, Greater London spreads out over an area of about 700 square miles and has population of about 8,222,500.

A Picture of London. Unlike large American cities with their towering skyscrapers, London is a city of comparatively low buildings. The city is not planned for beauty but rather for utility, although there are many fine buildings and wide boulevards. The smoke from the industrial districts and the fogs that often blanket the city for days at a time have given the buildings a drab appearance. In the business sections the crowded streets are narrow and winding. The business sections lie in what is known as East End, and here is the great port of London with its docks, piers, and shipyards. To the west are the government buildings, Westminster Abbey, the British Museum, and a fashionable residential section.

Streets and Squares. Along the north bank of the river is the famous Thames, or Victoria, Embankment, which is lined with large public and private buildings, gardens, and shade trees. Other notable thoroughfares include Fleet Street, devoted



MAP OF LONDON
showing the principal streets and stations.

Map by courtesy of London Passenger Transport Board

LONDON, COMMONWEALTH CAPITAL ON THE THAMES
Such sites as Trafalgar Square, Tower of London, and Westminster Abbey are etched in history.

chiefly to publishing; Pall Mall; the Strand; Lombard Street, which is the financial district; Whitehall and Downing streets, on which are situated many government offices; Piccadilly, which extends from the famous Piccadilly Circus; Bond Street, and the Haymarket.

London is well provided with parks and squares. Extending for three miles between Whitehall and Kensington is a chain of parks, including Hyde Park, Saint James's, and Kensington Gardens. Others are Hampstead Heath, Wimbledon Common, and Richmond Park. On the south side of London is Greenwich Park, in which is located Greenwich Observatory. There are also a number of squares, such as Covent Gardens, Soho, Leicester, Grosvenor, and Trafalgar.

Buildings and Monuments. The most centrally located of all the great public buildings is the "Old Lady of Threadneedle Street," which is the popular name for the Bank of England, built in the eighteenth century. The Houses of Parliament stand on the north bank of the Thames. Near by stands Westminster Abbey. Lying to the east is the famous Tower of London, the keep of which was built by William the Conqueror.

Other public buildings include Mansion House, the residence of the lord mayor, the four Inns of Court, and the Guild Hall. Included in the royal buildings of the city are Saint James's Palace, dating from the sixteenth century, Buckingham Palace, Marlborough House, and Kensington Palace. The British Museum and St. Paul's Cathedral are other notable buildings. During the bombing of London in World War II, some of these buildings were badly damaged and many famous landmarks destroyed.

Facing Buckingham Palace is the Victoria Memorial, which is one of the outstanding monuments. Others are the Cenotaph, a memorial to those killed in World War I, Nelson Column, in Trafalgar Square, and Cleopatra's Needle, on the Embankment.

Transportation and Communication. Transportation is provided by an elaborate network of underground railways and by bus and streetcar (tram) systems. Several subway tunnels cross the Thames, as do a number of wide bridges which are built high enough so that they do not interfere with travel on the river. The famous London Bridge was built in 1831 and remodeled in 1904. Since it is the most important city in the British Isles, London is the center of the great English railroads, four in number.

Trade and Manufacturing. London is the greatest commercial center and the foremost port in the British Empire. It lies in the center of the commercial world, and is the meeting point of all important sea trade routes. The port is well equipped to handle the vast amount of goods brought to its docks and warehouses. There are more than thirty miles of docks, all supplied with the most modern facilities. London not only handles the goods and products of the empire, but also serves as a point of transshipment for the goods of other countries.

The city is also the manufacturing center of the empire. Here are located industries of every description, and the products include clothing, textile goods, silk, chemicals, soap, boots and shoes, books, hardware, and steel products. Here also are the largest sugar refineries and breweries in the kingdom.

History. London's history begins shortly after Romans landed in England in the first century B. C. The Romans held the land for four centuries. London went through a period of decline until Alfred the Great made it the capital of his kingdom in the ninth century. During the next 200 years it became one of the leading cities in Europe, and under William the Conqueror it received its first charter. In 1665 London was struck by a great plague, which killed nearly 70,000 people. The next year much of the city was destroyed by fire. There followed a new building program, led by the great architect Christopher Wren. Rocket-bomb raids in World War II caused extensive damage; after the war, the city began rebuilding.

Consult the following articles for additional information:

British Museum
Greenwich
Saint Paul's Cathedral
Tower of London
Westminster Abbey
Wren, Christopher

LONDON COMPANY. America's first permanent colony, established at Jamestown in 1607, was founded by the London Company, chartered in London, England, a year earlier. Shortly after the company was formed for the purpose of colonizing America, it was divided, one company being called the Plymouth, or North Virginia, Company, and the other, the London, or Virginia, Company. See MAYFLOWER; PLYMOUTH COLONY; VIRGINIA.

LONGEVITY, *lon jev'i ty.* Long life, or duration of life longer than normal, is known as *longevity.* The excessive ages claimed by many people are not usually to be trusted, but it is true that there are more women than men who live to be very old. But the ripest age of man does not compare with the longevity of some animals. Salmon, for instance, have been known to live 100 years, carp 150 years, pike 150 years, and parrots 200 to 300 years. Swans sometimes pass the century mark, and elephants often live to be 150 to 200 years old. The life of the tortoise is known to be between 200 and 300 years.

Although it is improbable that any one race or nation produces persons of exceptionally long life, heredity and environment have an important bearing on longevity. Studies show that persons whose ancestors lived long will probably have long lives, too. Climate is an important factor in environment, temperate zones being more favorable to long life than the tropical regions.

LIFE SPAN OF ANIMALS

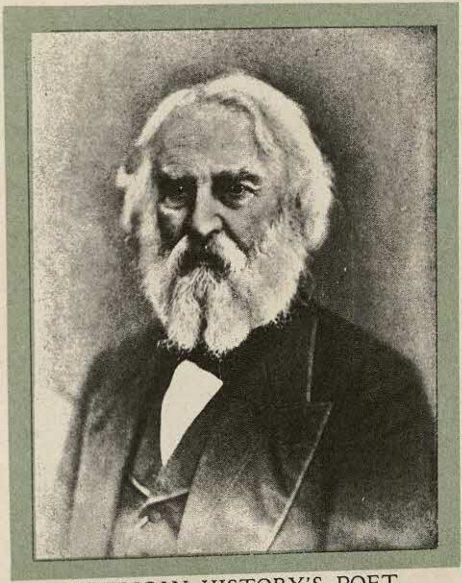
Another factor in long life is personal habit. It is believed that the rules of health and care of children practiced by Jews for centuries have been responsible for longevity among these people. Physical and mental activity are other factors tending to long life, shown by the years of Voltaire, Edison, Hippocrates, Bellini, and Goethe. See MORTALITY, LAW OF.

LONG'FELLOW, HENRY WADSWORTH (1807-1882). To many Americans, Henry Wadsworth Longfellow heads the list of the nation's poets. The reason is that his best-known works, *Evangeline, The Song of Hiawatha,* and *The Courtship of Miles Standish,* are familiar to old and young alike, loved for their beauty and interesting treatment.

Born on February 27, 1807, Longfellow came by his gentle and refined tastes naturally, for he inherited them from his mother, a descendant of John Alden. To his father he owed that cultured and broad view of life that is reflected in all his works. Longfellow was a fine student, and at Bowdoin College, from which he graduated at the age of eighteen, he distinguished himself, especially in the field of modern languages. Following a trip to Europe, he became a professor of languages at Bowdoin when he was twenty-two, married Miss Mary Potter two years later, and published his *Outre-Mer,* a collection of prose, in 1835.

A year after this volume appeared, Longfellow became professor of modern languages at Harvard, a position he held until 1854. Sadness entered his life before he took this position, however, for his wife died while they were on a trip to Europe. Later he was to lose his second wife, who was burned to death in his Cambridge home.

Longfellow's greatest period of writing was between 1839 and 1872. During that interval there were published *Hyperion,* a prose romance; *Voices of the Night; Poems of Slavery; The Spanish Student; Evangeline* (1847); *The Song of Hiawatha* (1855); *The Courtship of Miles Standish* (1858); *Tales of a Wayside Inn* (1863), and *Christus,* a trilogy.

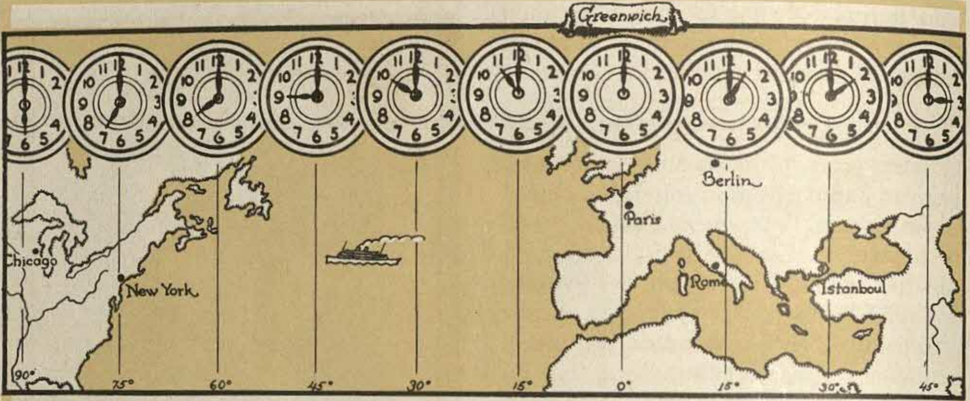


AMERICAN HISTORY'S POET
Henry Wadsworth Longfellow, one of the most popular of America's literary figures.

While on his last trip abroad with his three daughters, in 1868-69, he was given honorary degrees by Oxford and Cambridge universities. After he returned to America, he continued to write.

Longfellow is remembered for his encouragement of the study of foreign literature and for his influence on writing in America, as well as for his writings. His home, Craigie House, in Cambridge, was the gathering place for all prominent writers and scholars of the day. After Longfellow died, a bust of him was placed in the Poets' Corner of Westminster Abbey, England, an honor never before accorded to an American writer. See EVANGELINE.

LONG ISLAND. Jutting out into the Atlantic Ocean, Long Island forms the southeastern extremity of New York state. Having a length of 118 miles and a width of twelve to twenty-three miles, the island is a vast suburb of New York City and is dotted with many towns and estates where thousands of city workers live. It is connected with New York City by five great bridges over the East River, and by the



THE CLOCK DIVIDES THE GLOBE WITH LONGITUDINAL MARKINGS

It's twenty-four hours around the globe; every fifteen degrees marks an hour's time.

subway system. The chief city is Brooklyn, which is a part of Greater New York. See New York City.

LONGITUDE, *lon'ji tude*. Between the north and the south poles on the earth's surface run imaginary lines. These lines are called *meridians,* and are used to determine distance, or *longitude,* east or west of the *prime meridian*—that line extending through Greenwich, England.

Like latitude, longitude is measured in degrees; it begins with 0° at the Greenwich meridian and is measured through 180° east and 180° west of Greenwich, a total of 360°. The meridians meet at a point at the poles, from which they spread out until they reach the equator, where one degree of longitude measures 69.65 statute miles. (See, for instance, the map on page 139.) Actually, longitude is the measurement of the angle formed by the meeting at the poles of the Greenwich and the local meridians. See Latitude; Longitude and Time; Meridian.

LONGITUDE AND TIME. Man's system of reckoning time is based on the earth's continuous rotation on its axis from west to east, which makes the sun appear to travel from east to west. Time measured from this apparent motion of the sun is not the same everywhere at once, the differences being due to the difference in longitude, or distance east and west.

To understand how time is calculated by longitude, it must be remembered that the earth makes a complete revolution in twenty-four hours. That is, the interval between successive noons at any one place equals twenty-four hours. The earth has 360° of longitude; in other words, it revolves 15° in one hour, since 360° divided by 24 equals 15°. The earth's surface has been divided into twenty-four time zones of 15° each, one for each hour. Time zones are described in the article Standard Time.

We find, therefore, that London is six time zones, or approximately 90° of longitude, east of Chicago; that is, noon occurs there six hours before it does in Chicago. New York is one time zone, or about 15°, east, and Los Angeles two time zones west of Chicago. Thus when it is noon in Chicago, it is 6 P.M. in London, 1 P.M. in New York, and 10 A.M. in Los Angeles.

Longitude is easily determined by navigators by the use of the chronometer, a very exact clock which is set according to time at Greenwich, England, located on the zero meridian. When the difference in time between Greenwich and any location is known, the exact longitude of the place may be found by multiplying by 15.

All places on the same meridian have the same time, regardless of their latitude. In some cases, however, the boundaries of the time zones have been varied to include more territory. In the United States there are four time belts—Eastern, Central, Mountain, and Pacific. See GREENWICH; INTERNATIONAL DATE LINE; LONGITUDE.

LONG PARLIAMENT. For twenty turbulent years in the seventeenth century, England had no election to select members of Parliament. Its governing body from 1640 to 1660 was the Long Parliament, probably the most notable legislative assembly in English history.

Called by King Charles I in 1640 to vote him money, it rebelled and petitioned the king first to correct the abuses he had inflicted upon the people by heavy and unjust taxation. Then it became involved in religious differences which resulted eventually in the expulsion of Presbyterian members. The *Rump Parliament* remained.

The Long Parliament carried on the civil war against Charles and was responsible for his execution and the installation of Cromwell as Lord Protector. Although Cromwell had dissolved the Rump Parliament in 1653, it met again after his death, ordered an election, and dissolved itself in 1660. See CHARLES I; COMMONWEALTH OF ENGLAND; CROMWELL, OLIVER.

LONG′STREET, JAMES (1821-1904). Few Confederate leaders had the satisfaction of serving the government they fought and the privilege of seeing the nation once split by slavery become a world power. One of the few was James Longstreet, an outstanding general of the South, whose aid at the opportune time won the second Battle of Bull Run; who saw brilliant service in the victory of the South at Fredericksburg; and who had a valiant part in the battles at Gettysburg, Chickamauga, and the Wilderness.

A native of South Carolina, Longstreet attended West Point and won honors for bravery in the Mexican War. After the Civil War he was appointed minister to Turkey and, later, commissioner of Pacific railroads, a position he held when he died at the age of eighty-three.

LOOM. See WEAVING.

LOON. See DIVER.

Courtesy Southern Pacific Railroad

METROPOLIS FROM DESERT

The huge, sprawling city of Los Angeles was once a sandy waste, apparently worthless.

LORDS, HOUSE OF. See GREAT BRITAIN.

LORRAINE. See ALSACE-LORRAINE.

LOS ANGELES, *lohs ang′gel es,* or *los an′ je les,* CALIF. Set in a fertile valley studded with beautiful tropical plants and trees and enjoying a mild climate, Los Angeles is a famous tourists' resort. It is the largest city on the Pacific coast of America. The seat of Los Angeles County, the city is located on the Los Angeles River south of the Sierra Madre and fifteen miles inland from the Pacific Ocean. It has a population of over 2,473,000, and an area of about 455 square miles. Its metropolitan area has a population of 6,757,000, the second largest in the country. It is surrounded by suburbs, including Glendale, Pasadena, Santa Monica, Beverly Hills, and many others. Hollywood is now part of the city proper.

Industry and Trade. From the standpoint of location and climate, Los Angeles is ideally situated for trade, both foreign and domestic. Although located fifteen miles from the ocean, the city is directly connected with its ports at Wilmington and San Pedro by a narrow strip of city-owned property. Los Angeles thus has a water frontage of nearly twenty miles and is a port of call for some 150 steamship lines which serve all parts of the world. Sums totaling nearly $42,000,000 have been spent by Federal and local authorities for the improvement of harbor facilities, with the result that more tonnage is shipped out of Los Angeles yearly than from almost any other American city. For domestic commerce, the city is connected with all points in the United States by railroad lines, as well as by motor-truck, bus, and air transportation.

The leading industry in the territory around the city is agriculture; Los Angeles County produces more foodstuffs than does any other county in the United States. The climate and long growing season permit the cultivation of semi-tropical fruits and delicacies, among which are oranges, lemons, apricots, grapefruit, grapes, and winter vegetables.

Among the other important industries are the production of oil, petroleum refining, the manufacture of women's wearing apparel, the building of aircraft, and mining the large deposits of non-metallic minerals, such as lime, gypsum, borax, potash, and talc, located in the fields east of the city. Another widely known industry is that of moving pictures, Hollywood being the world center of the business. Serving the thousands of tourists who pour into California is in itself a major industry.

History and Development. The history of Los Angeles began in 1781 with a Spanish settlement named *El Pueblo de Nuestra Señora la Reina de los Angeles* (City of Our Lady, Queen of the Angels). It remained a small Spanish settlement and by 1810 had a population of only 365 persons. In 1846 California was annexed by the United States, and shortly afterward Los Angeles was incorporated as a city. In 1850 the gold rush and the discovery of oil in the area attracted thousands of people, and the city grew rapidly. The real growth of the city did not begin until 1918, after which the population increased 1,000 per cent over a period of twenty years.

The city of Los Angeles is governed by a mayor and a council. There have been many civic improvements, but the most notable one is the great aqueduct which supplies the city with water. This giant tube is 235 miles long and diverts the flow of the Owens River near the base of Mount Whitney. With a capacity of 259,000,000 gallons per day, this aqueduct is also a part of the city's electric-power system, now augmented by the output from Boulder Dam. More than 4,000 acres of city property are devoted to a park system. There are many historic structures in and about Los Angeles, particularly the old Spanish missions and churches. Located in the city are several educational institutions, includ-

THE STORIED BLOSSOM

Few plants are so associated with legend as is the lotus. This is the American variety.

CELEBRATED BEAUTY
The water lily, which is akin to the lotus, has to its credit much great nature poetry.

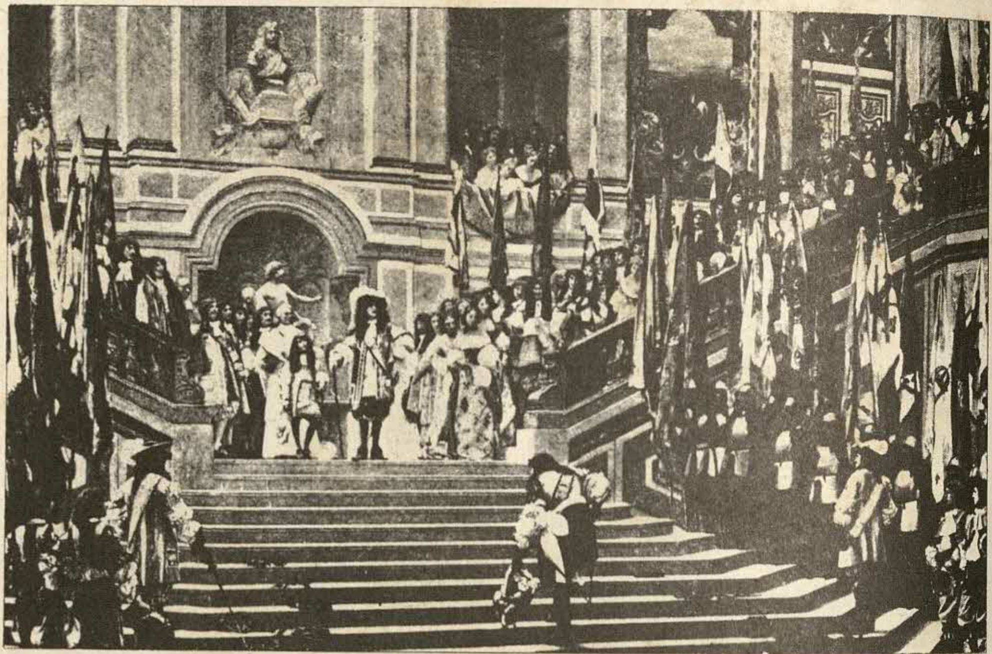
ing the University of Southern California, the University of California at Los Angeles, and Occidental College.

LO'TUS. A well-known passage in Homer's *Odyssey* describes the lotus-eaters, who lived in dreamy forgetfulness because they ate of the fruit of the magic lotus plant. The lotus of the ancient Greeks was a species of jujube tree. A beautiful white water lily found in Egypt bears the name. The sacred lotus of the Hindus is also a water lily; so, too, is the American lotus, or *water chinquapin*. Botanists have given the name *Lotus* to a genus of plants related to the peas, of which the *bird's-foot trefoil* and *winged pea* are typical species.

LOUIS, *loo' is,* or *loo'e,* **I** (778-840). The son of Charlemagne, Louis I succeeded to his great Empire of the West in 814. After ruling for three years, he divided the kingdom among his three sons, Lothair, Pepin, and Louis. This arrangement stood until 829, when Louis tried to make a new division to include his fourth son, Charles II, or Charles the Bald, born to his second wife, Judith of Bavaria. This arrangement led to a revolt on the part of the elder sons, which lasted until Louis died. Lothair succeeded his father as emperor, and since Pepin had died in 838, a new division was made in the Treaty of Verdun to include Charles, who was given the area from which France developed. Louis was given the area from which Germany later developed. See CHARLEMAGNE.

A ROYAL CRUSADER CAPTURED
The devout French king, Saint Louis, once fell into the hands of the pagan Saracens; was released on the payment of a ransom.

LOUIS IX (1214-1270). Succeeding to the throne of France in 1226, Louis IX was destined to play an important part in the medieval Crusades. While very ill in 1244, he made a vow to make a crusade to Palestine. Four years later he set sail for Cyprus with a large army, and in 1248 went to Egypt and the Holy Land. Captured by the Mohammedans, Louis was released only on the payment of a large ransom and did not return to France until 1252. During the next few years he improved internal conditions in France and decreed many beneficial laws. In 1270 he again set out on a crusade to Tunis, in North Africa, where he was victorious, but



POMP AND SPLENDOR FOR THE PROUDEST OF THE KINGS OF FRANCE
Louis XIV, whose despotism and enormous conceit earned him undying notoriety, built the fabulous palace at Versailles; held his resplendent and costly court levees there.

a plague later broke out in the city and Louis died. Canonized by Pope Boniface VIII in 1297, Louis IX is also known as Saint Louis. See CRUSADES.

LOUIS XIII (1601-1643). The most important event of the reign of Louis XIII was the relentless war carried on against the French Huguenots, or Protestants. Louis, son of Henry IV, succeeded to the throne at the age of nine under the regency of his mother, Maria de' Medici. Declared of age in 1614, the young king nevertheless remained under Maria's domination for several years. His mother was banished from court in 1631. In 1624 Louis came under the influence of Cardinal Richelieu, whose oppressive policy brought on the revolt of the Huguenots, but the rebellion was quelled with the capture of the Huguenot headquarters at Rochelle in 1628. Richelieu also advised Louis to enter the Thirty Years' War, which gained the province of Alsace for France.

LOUIS XIV (1638-1715). Ambitious, extravagant, and autocratic was Louis XIV, whose reign marked one of the most splendid as well as most unfortunate periods in French history. A typical autocrat, this king expressed his theory of absolute power in the phrase *L'état c'est moi* (I am the state).

Succeeding his father, Louis XIII, at the age of five, Louis XIV was beset during the early years of his reign by the wars with Austria and Spain and by the bitter quarrels between the French legislature and the king's minister, Cardinal Mazarin. The war with Spain was concluded in 1659, and Louis married Maria Theresa, the daughter of the Spanish king.

Two years later Mazarin died, and Louis took complete control of the government and instituted many changes, especially in the methods for raising taxes, in which he was advised by the famed Colbert. At this time France developed rapidly as a commercial and industrial nation with the establishment of the Company of the Indies, the building of roads and canals, and the organization of many factories.

When the king of Spain died, Louis claimed certain Spanish provinces in the Netherlands as well as in Luxemburg and Franche-Comté, and caused a war with Holland in 1672. Louis, victorious for a time, was blocked by the alliance of Spain, Holland, and Denmark. But the Peace of Nimeguen, signed in 1678, gave Franche-Comté and a part of Flanders to France.

Louis was now at the height of his power, but his ambition brought about a rapid decline in French fortunes. The ill-advised revocation of the Edict of Nantes in 1685 drove out the Protestants, many of whom were business and industrial leaders. The formation of the League of Augsburg led to a general war, as a result of which France lost most of her recent territorial acquisitions at the disastrous Peace of Ryswick in 1697. The War of the Spanish Succession followed soon after, and France suffered severe losses but was able to maintain her conquests by the Treaty of Utrecht in 1713. The combination of two expensive wars and the revocation of the Edict of Nantes, as well as the extravagance of the court, left France poor and her industries and trade at a standstill.

Louis died in 1715 after a reign of seventy-two years, the longest in the history of Europe. He was succeeded by his great-grandson, Louis XV.

For additional information consult the following articles:

France
Marlborough, Duke of
Mazarin, Jules
Nantes, Edict of
Succession Wars
Utrecht, Peace of

LOUIS XV (1710-1774). The extravagances of the reign of Louis XIV were continued by his great-grandson, Louis XV, who succeeded him in 1715 at the age of five. Until 1723, however, the country was disastrously governed under the regency of the Duke of Orleans. In 1726 Louis appointed Cardinal Fleury as his chief adviser. Because of his marriage to the daughter of the king of Poland in 1725, Louis became involved in a war in 1734 to regain his father-in-law's lost territory. By the Peace of Vienna in 1735, Louis succeeded in acquiring the Lorraine.

UNFORTUNATE LOUIS XVI

This was the French king struck down by the terrible Revolution which began in 1789. He was finally beheaded on the guillotine in 1793.

When Charles VI died, in 1740, the War of the Austrian Succession broke out. The signing of the Treaty of Aix-la-Chapelle in 1748 ended the war but gained nothing for France. The expensive Seven Years' War (1756-1763) marked the closing years of Louis' reign, during which France lost India and Canada to England by the Peace of Paris in 1763. The rule of Louis ended with French power and prestige at a low ebb and resources much diminished.

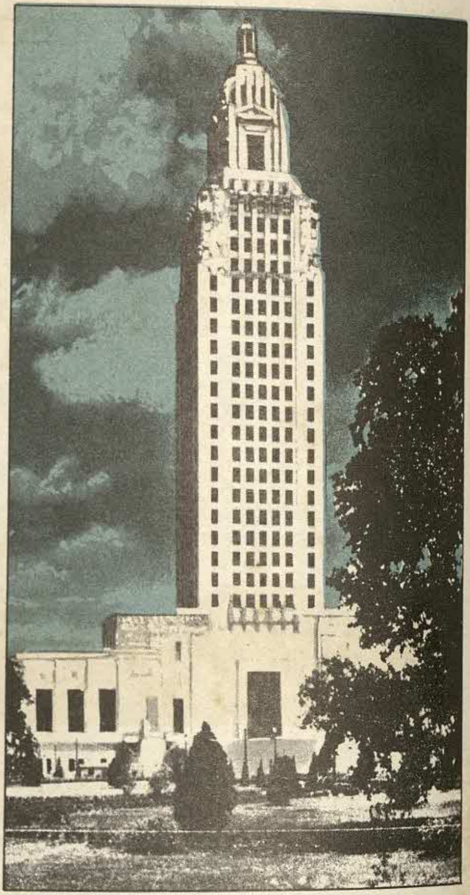
LOUIS XVI (1754-1793). A king who was willing to help his people but who was hindered by his lack of ability, Louis XVI paid the penalty for the excesses and extravagances of his two predecessors on the French throne. Discontent among the people was widespread; and although Louis tried to remedy the situation, he was unable to do so because he knew little about affairs and could propose no effective measures. Several ill-advised appointments to the office of finance minister led to greater discontent, and finally the people of France revolted in 1789 and captured the Bastille. This event marks the beginning of the historic French Revolution.

In 1791 conditions became so bad that Louis attempted to flee Paris but was followed and forced to return. In August, 1792, a mob attacked the royal palace. Louis fled to the National Assembly, where he was arrested and later tried for conspiracy before the National Convention. Found guilty on January 16, 1793, Louis was marched to the guillotine five days later, where the sentence of death was carried out. His queen, Marie Antoinette, was guillotined in October of the same year. See FRENCH REVOLUTION; MARIE ANTOINETTE.

LOUIS XVIII (1755-1824). The brother of Louis XVI, Louis XVIII remained a king in exile until 1814. After Louis XVI was guillotined, his son was declared Louis XVII, although he never actually reigned. After the mysterious death of the boy, presumably in 1795, Louis XVIII was made king of France and Navarre. Unable to enter France, Louis wandered about Europe for many years, finally settling in England, where he remained until the fall of Napoleon. Entering Paris in 1814, Louis began his reign but fled when Napoleon returned to France after escaping from Elba. After the defeat of Napoleon at Waterloo, Louis again became king and ruled until his death. Although personally weak, Louis was a despotic ruler.

LOUISIANA, *loo e ze ah'nah.* Guarding the mouth of the Mississippi River is romantic old Louisiana, a state whose history dates back to the days of the Spanish explorers. Louisiana is popularly called "the Pelican State" or "the Creole State."

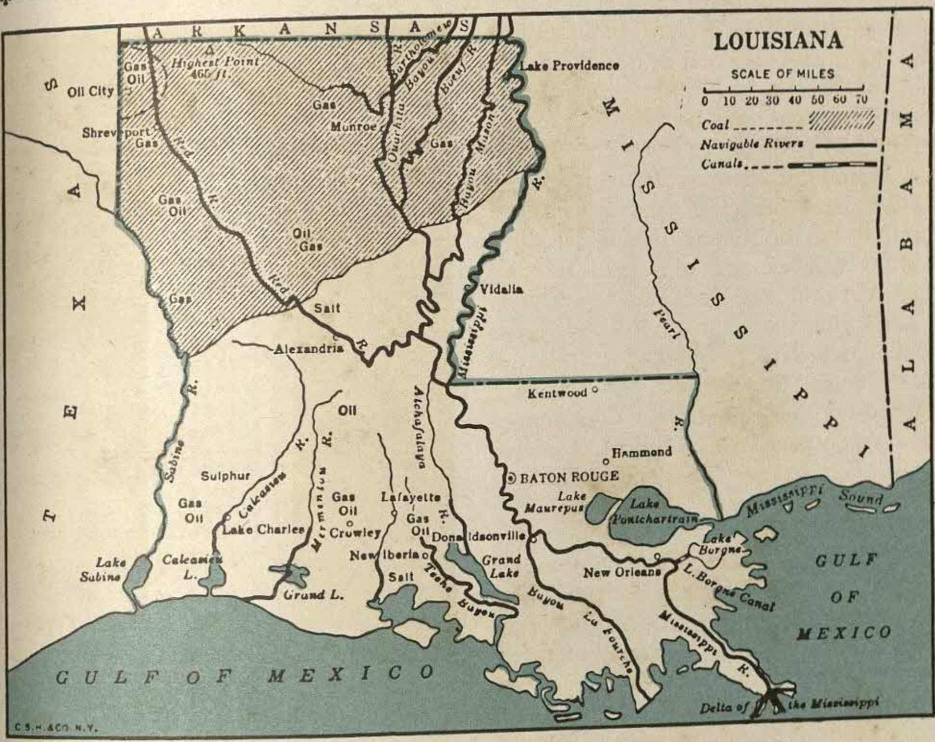
Its Fascinating Geography. The area of Louisiana is 48,523 square miles, and the population is about 3,264,000. The Gulf of Mexico is the southern border of the state. The Mississippi River forms about half the eastern boundary, suddenly swerving inward and continuing its journey in a southeasterly direction to the delta. The state of Mississippi completes the eastern boundary; to the north lies Arkansas; to the west, Texas.



NEW SOUTH'S SYMBOL
The skyscraper capitol of Louisiana is a monument to the state's modern industrial expansion.

From the northwest corner flows the Red River; from the northeast, the Ouachita. They join near the center of the state and pour their combined waters into the Mississippi. In addition to these streams, Louisiana has many navigable bayous. There are also numerous lakes, those in the south, near the Gulf, being brackish water. Others, along the Mississippi, have been cut off by changes in the course of the river.

The land is remarkably low and level; many inland cities are less than twenty feet above sea level. Because of the low land, many miles of levees have been built



COTTON, SUGAR, COAL, OIL, GAS, SALT, AND LUMBER

Louisiana, lying in a rich alluvial basin, has all these to produce wealth for her.

to keep the streams from overflowing their banks.

The climate of the state is delightful, averaging from 65°F to 68°F, but in summer the temperature may reach 100° at times. Cold weather is rare, although frosts sometimes occur from November to March. A rainfall of from fifty to sixty inches is the average for the state. Louisiana has a serious drainage problem.

Resources. The state ranks among the first ten in the United States in value of mineral products, being one of the leading producers of natural gas, sulfur, natural gasoline, and salt; four of the world's largest salt mines are in Louisiana. The output of petroleum is large. Cement, clay products, sand, and gravel, produced in smaller quantities, contribute to the state's mineral wealth.

Trapping is of great importance, the most valuable pelts being those of the muskrat, mink, opossum, and raccoon. Fishing, too, adds millions of dollars to the annual income; Louisiana is famous for its shrimps, oysters, crabs, and other sea food. Valuable forests of pine, cypress, and other trees make Louisiana one of the great lumber-producing states.

Agriculture and Manufacturing. Louisiana ranks high as an agricultural state, leading all other states in the production of rice and sugar cane. Cotton, too, is important, the yield averaging between 600,000 and 1,000,000 bales a year. In addition, great quantities of fruits, vegetables, nuts, and grains are raised. Large numbers of cattle and other livestock also contribute to the wealth of the state.

Manufacturing, too, has developed in Louisiana. The refining of sugar leads, although the manufacture of tobacco, cottonseed, lumber, machine and foundry products, and bags flourishes. Along the southern coast, oyster packing and shipping are important.

International Salt Co.

Louisiana Department of Conservation

WEALTH FROM LOUISIANA'S SEAS
Above, tons of salt are mined from an ancient sea, now far underground at Avery Island. Right, a few of Louisiana's 3,000 licensed shrimp trawlers tie up on the Gulf Coast.

Transportation and Commerce. The state has nearly 5,000 miles of railways. The state also has nearly 5,000 miles of navigable waterways, including a canal between Lake Pontchartrain and the Mississippi River at New Orleans. Nearly 25,000 miles of highways provide for motor transportation.

People. Louisiana was originally settled by the French, and many of the people are descendants of these early French. The foreign population of Louisiana is predominantly Italian. Nearly one fifth of all the people in the state live in New Orleans.

Government, Education, and Institutions. Louisiana has a legislature of two houses. The senate has thirty-nine members and the house of representatives 100 members. Both houses are elected for four years and meet biennially. Many of the provisions of the *Code Napoleon* have been made a part of the state's civil laws. The local units are parishes, corresponding to counties in other states. The capital of the state is Baton Rouge.

Separate elementary schools are provided in Louisiana for white and colored children. Chief among the institutions of higher learning are Louisiana State University at Baton Rouge, Tulane and Loyola universities at New Orleans, Louisiana Polytechnic Institute at Ruston, Louisiana State Normal College at Natchitoches, and Louisiana College at Pineville.

History. A Spaniard, Alvarez de Piñeda, was possibly the first white man to set foot on Louisiana soil (1519). It is also probable that De Soto, another Spaniard, explored Louisiana some twenty years later. The first Frenchman to enter Louisiana was La Salle. Arriving in 1682, he claimed for France all the land drained by the Mississippi and named it Louisiana in honor of the French king, Louis XIV. The first settlement was made in 1699 by Sieur d'Iberville at Biloxi, now a Mississippi town. Nineteen years later, Sieur de Bienville, governor of the colony, founded New Orleans.

Some years later, Louisiana was made a royal province. Then, in 1762, France ceded

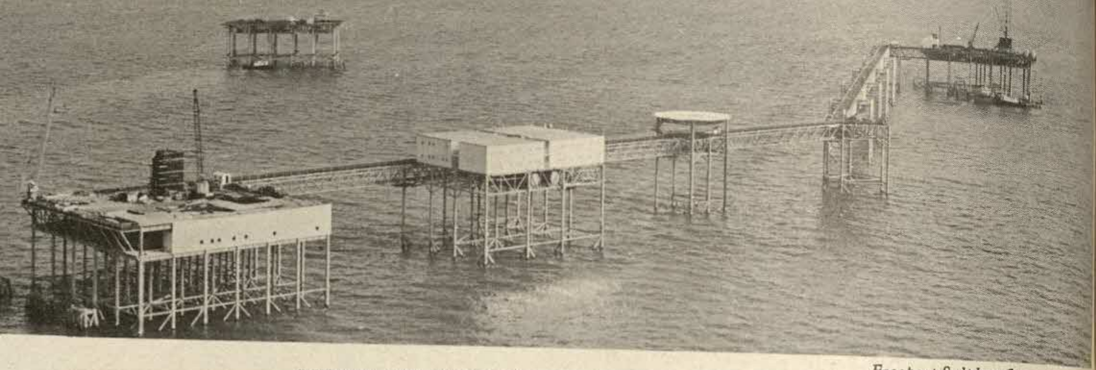
Above, courtesy Southern Pacific Railway

ALL THE OLD SOUTH'S GRACE

The charm of old France makes Louisiana. Nowhere else are such romantic mansions set in tropic greenery. And nowhere else does one see such lovely, lacelike ironwork as adorns houses in New Orleans' *Vieux-Carré* (right).

to Spain all the land west of the Mississippi, and at about the same time all the land east of the river went to England. In 1800, however, Napoleon recovered the Louisiana Territory from Spain and sold it to the United States three years later for $15,000,000. Louisiana was admitted to the Union in 1812.

Baton Rouge has been the capital since 1849, except for a period after the Civil War. At the beginning of the Civil War, Louisiana joined the Confederacy. In 1862 New Orleans was captured by Union soldiers, and the loss of the city's trade greatly handicapped the state. At the close of the war Louisiana became a hotbed of hostilities between the Negroes and whites



Freeport Sulphur Co.

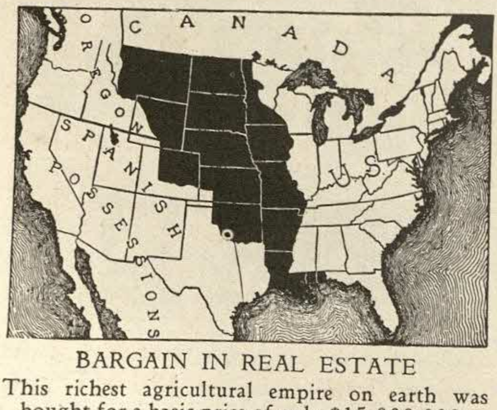
MINES ON STILTS ADD TO SULFUR SUPPLY

One of America's largest offshore sulfur mines, at Grand Isle, La., began producing in 1960. The United States mines about two thirds of the world's sulfur, chiefly in Louisiana and Texas.

over the control of the government. Not until 1877 was order restored and Federal troops withdrawn. Since that time, much progressive legislation has been passed, and Louisiana has prospered. See BATON ROUGE; NEW ORLEANS.

LOUISIANA PURCHASE. In 1803 the area of the United States was more than doubled by the purchase of the Louisiana territory from France. The new land extended northward from the Gulf of Mexico and west to include the Mississippi basin. Thirteen states, in whole or in part, were in time organized from this territory, and today more than 24,000,000 people live within their borders.

In 1802 it was found that Spain had ceded Louisiana to France by a secret treaty. Fearing that France would block the mouth of the Mississippi River, thus cutting off the trade route of the western section of the United States, President Jefferson began negotiations to purchase the land at the mouth of the river. Robert Livingston, minister to France, and James Monroe were commissioned to negotiate with Napoleon. Napoleon, badly in need of money to carry on his European military campaign, offered to sell the entire Louisiana territory for 80,000,000 francs; it was agreed that the French debts to American citizens would be assumed by the United States in the amount of 20,000,000 francs, to be included in the purchase price. The agreement, which was dated April 30, 1803, was ratified by Congress on October 20 of that year. It was later discovered that the terms of the treaty between France and Spain had not been carried out, but Spain was unable to press its case, under the influence of Napoleon.



BARGAIN IN REAL ESTATE

This richest agricultural empire on earth was bought for a basic price of only $15,000,000.

At first President Jefferson felt that the purchase was unconstitutional and urged the passage of a constitutional amendment. However, the purchase was so popularly received that the proposal was abandoned.

The purchase price of the territory was $15,000,000, although the total cost to the United States finally amounted to about $27,250,000 because of the interest payments.

LOUIS PHILIPPE, *loo e' fe leep'* (1773-1850). Entering the army in 1791, Louis Philippe, son of the Duke of Orleans and later king of France, favored the cause of the Revolution, taking part in battles at Valmy, Jemappes, and Neerwinden. From 1793 until the fall of Napoleon he was in exile, and he spent several years in the United States. After Charles X was deposed by the revolution of July, 1830, Louis was declared "Lieutenant General and Regent of the Kingdom," and in August was made king.

He was an ambitious, aggressive man, and in order to make his position more secure began to reach out and form alliances with the other royal houses of Europe. His rule was very unpopular with all classes because he refused to institute certain reforms, and the revolution of 1848 drove him from the throne. He fled to England, where he remained until his death.

LOUISVILLE, *loo′ y vil,* or *loo′ is vil,* KY. Located in the heart of one of America's richest and most productive areas, Louisville is the largest city in Kentucky and one of the South's chief industrial and trading centers. It is situated on the Ohio River, 130 miles southwest of Cincinnati and 400 miles from the Mississippi River, and is the seat of Jefferson County.

Served by nine railroads and four Ohio River barge lines, as well as numerous bus, truck, and air routes, Louisville is well equipped to be a great trade outlet for the South. Among industrial products tobacco is of especial importance, Kentucky being second only to North Carolina among the tobacco-producing states. Other manufactures include flour, clothing, plumbing equipment, railroad-shop products, bakery goods, refined oil, agricultural implements, electrical machinery, and dental goods.

Louisville is the site of many fine educational institutions, including several technical schools and a college for Negroes; and the city also has an extensive park system of 2,400 acres.

The town was founded by George Rogers Clark in 1778 and was incorporated in 1780. The population is about 390,000.

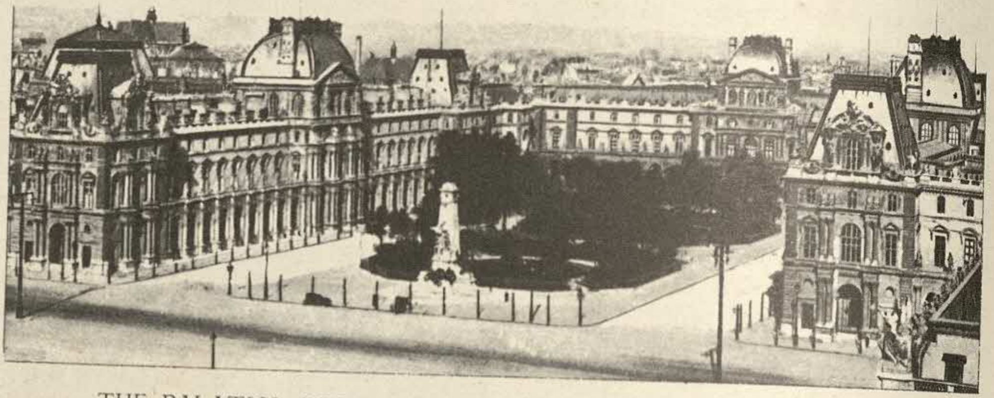
LOUSE. Few pests are more irritating than the louse, that tiny insect which feeds on the blood of man and animals. There are several different varieties of the creature, but the most common has a flattened, nearly transparent body divided into many segments, and has legs with short claws which give it a firm grip. The louse has two simple eyes and a sucking mouth.

Lice are a serious problem among large groups of people who have little opportunity to bathe; and to soldiers in field service, the "cooties," as they have been called, are extremely distressing. Victims of their attacks must wash thoroughly with strong soaps and insecticides to kill the lice, and the clothing must either be steamed or boiled.

THE GREATEST TREASURY OF ART
The magnificent Louvre in Paris houses the most notable collection of paintings, sculpture, and antiquities in the entire world.

LOUVRE, *loo′ vr′.* Statues, paintings, relics, and many other forms of art, so valuable that one could not hope to place an estimate on their worth, are contained in the buildings of the Louvre, greatest of all the world's art museums. Here may be seen the original *Mona Lisa* by Leonardo da Vinci, and the finest works of Murillo, Titian, Rembrandt, and others whose names are among the immortals. In its halls may be seen examples of the world's finest sculpture, notable among which are the *Venus de Milo* and the *Winged Victory of Samothrace.* All in all, the collections of the Louvre surpass those of any other museum in the world.

Located on the Seine River in Paris, the Louvre consists of several structures. The oldest, begun in 1204, once was a fortress and a prison. The building known as the Old Louvre was built after 1541 by Francis I, but successive kings enlarged and orna-



THE PALATIAL HOME OF THE GREATEST HERITAGE OF MAN
That heritage is his art, and much of the best of it is in the Louvre at Paris.

mented it considerably. Napoleon I began the New Louvre to hold the art collection he had amassed in his conquests. Completed in 1857 by Napoleon III, the buildings are on a grand scale, typical of the ornate architecture of the time.

LOWELL, James Russell (1819-1891). Biographers find it difficult to classify James Russell Lowell because of the many fields in which he employed his talents. He is perhaps best known for his poems and essays, yet he was equally outstanding as a critic, a diplomat, and an orator. Reared in the traditions of New England in his ancestral home of "Elmwood" in Cambridge, Mass., he began his career as a lawyer. His interests, however, were not in the legal profession, and in 1843 he was instrumental in the founding of *The Pioneer,* a magazine to which Hawthorne, Poe, and Whittier were contributors.

Of Lowell's poems, perhaps the best known is *The Vision of Sir Launfal,* published in 1848. The *Biglow Papers,* satirical poems in dialect which first appeared in the Boston *Courier* in 1846, made him a popular literary figure, and *A Fable for Critics* (1848) increased that reputation. His best work was inspired by Maria White, whom he married in 1844 and who died in 1853.

Lowell took his wife abroad for her health in 1851-52. This experience contributed much to his literary career, and fitted him to succeed Longfellow as professor of modern languages at Harvard University in 1855. Two years later he became the first editor of the *Atlantic Monthly.*

JAMES RUSSELL LOWELL
One of the great New England poets who wrote during the nineteenth century.

Active in the Republican party, in 1877 Lowell was appointed minister to Spain by President Hayes. In 1880 he took over the more important post of minister to England and held this position until 1885. In that year he lost his second wife, whom he had married in 1857. Six years later his own days were ended in the house where he was born.

Some of Lowell's other writings include: *The Second Biglow Papers,* dealing with the Civil War; *The Commemoration Ode,* in memory of Harvard men who fell in the Civil War; *Under the Willows,* a book of verse; *Memorial Poems;* and *Fireside Travels, Among My Books,* and *My Study Windows,* critical and descriptive essays.

LOWER CALIFORNIA. Jutting out at the southern end of the state of California is Lower California, belonging to the Republic of Mexico. It consists of the State of Baja California and the Territory of Baja California Sur, with a combined population of 540,000. Lower California is bounded on the west by the Pacific Ocean and on the east by the Gulf of California. This mountainous and unproductive peninsula, varying in width from 30 to 140 miles and having a total length of 750 miles, has an average annual rainfall of about twelve inches, and its climate is hot and dry. The chief cities are La Paz and Ensenada.

LOYO'LA, IGNATIUS OF (1491-1556). Although Saint Ignatius of Loyola never journeyed to America himself, the New World owes much to him. For he was the founder of the Jesuits, the members of which took such an active part in the exploration of the New World.

His real name was Inigo Lopez de Recalde, and it was under this name that he entered the Spanish army and warred against the French. While recovering from a severe wound received at the Battle of Pampeluna in 1521, he read several religious books, and forthwith decided to devote his entire life to furthering the Catholic faith. He changed his name to Ignatius of Loyola, after the name of the castle in which he was born, and, following a visit to the shrine of the Virgin at Montserrat, vowed to become her knight. The next few years were spent in travel and study, and in 1534 he formed the Society of Jesus, or Jesuits.

Headquarters were set up in Rome and Pope Paul III confirmed the order in 1540. Loyola remained in Rome until his death, directing the affairs of the Jesuits and laying down the principles of service to the Church and the conversion of nonbelievers. In 1607, under Paul V, he received beatification, and in 1622 he was declared a saint by Pope Gregory XV. See JESUITS.

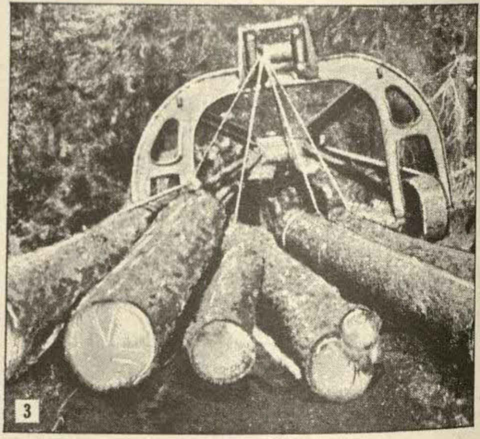
LUKE, SAINT. The New Testament *Gospel According to Saint Luke* has been called the most beautiful book in the world, and certainly its author, a Greek physician, had a far better command of language than did the authors of the other two synoptic gospels (*Matthew* and *Mark*). Luke is also believed to have written *Acts of the Apostles.* He was probably a citizen of Antioch in Syria, and he joined the Christian movement as the companion and physician to Saint Paul, thus gathering his material for *Acts* at first hand. The gospel itself, however, was a scholarly biographical work based on the *Mark* gospel and probably on some other now unknown sources. It is generally agreed that Luke did not know Jesus personally.

LUMBER. Wood undergoes many changes in shape and name from the time life appears in the seed until the product becomes useful to man. In the forest, wood is a tree; when it is cut down, it is a log; when it is sawed into boards, planks, laths, shingles, or blocks, it is lumber; and when turned into a chair or table, it is furniture. The business connected with the cutting, transportation, and conversion of wood from a tree to the stage where it is ready to be useful to man is the lumber industry, a colorful commercial activity of man that ranks among the largest in the world.

Lumber is produced wherever man is commercially able to utilize forests. Because Canada and the United States have the greatest forest areas, they are the leading lumber-producing countries. But Russia, Norway, Sweden, Germany, and France also produce a large supply of timber, as do many tropical lands. In the United States, between fifteen and thirty-seven billion board feet are cut yearly, with the Far West region the leading section. The

(1 and 3) Courtesy Popular Mechanics

FORESTS MEAN NATIONAL WEALTH
The days of reckless destruction of timberland for lumber are past; lumbering is now done with an eye to conservation and future need. (1) Starting the cut in a Douglas fir. (2) Trimming branches. (3) An arch tractor for logs.



unit of the "board foot" is the equivalent of a board one foot long, one foot wide, and an inch thick, or 144 cubic inches.

The uses of lumber are varied. The many different kinds of trees, each having a soft or hard quality of wood, are suited to the individual purposes. For instance, southern pine is suitable for heavy beams in buildings and bridges; hard maple and white oak are excellent for inside woodwork and for floors; and white pine, soft and durable, is a fine wood for the siding of houses. Most of the timber cut in the United States each year is soft wood, with yellow pine leading, followed by Douglas fir and white pine. In Canada, however, spruce is the leader, followed by Douglas fir and white pine.

From Forest to Lumberyard. Generally, wood goes through three stages before it is lumber. First, it is logged, or cut down and transported to the sawmill. In this stage some of it is used for beams and poles. Next it is cut into boards or rough lumber. As a third step it is planed.

Most interesting of the three is the logging phase. In this process the trees that eventually will become lumber are cut down by crews of lumberjacks, who, in the northern forests, swing their axes and pull their saws during the winter time when it is easier to transport the logs. Lumber camps are set up in the forests, and kitchens and bunkhouses are built. Each day the men go off in pairs to saw down the giants of the forests. The saws are very large and must be handled by two men, who, through long practice, learn how to obtain the quickest and most powerful stroke with a minimum of effort.

Sometimes, before the tree is felled, one man will climb to the top of the tree and lop off the top. This is extremely dangerous work. When the tree is down, other men with axes chop off the branches, and cut the trunk into convenient sizes. Then horses or mules draw them to the road, where they may be hauled on a temporary railroad to the sawmill or to a depot. Where there are large rivers, the lumbermen still transport the logs to the bank of the stream; and when spring comes, and the water is high, millions of logs are floated down the river to the sawmill.

Here, again, the lumbermen display their unique skill, for they ride the twirling, tossing logs downstream, hopping from one to the other with only their hobnailed shoes and pikes to keep a footing. When the logs strike an obstruction and pile up into a mountain of logs twisted every which way, the men, called *log drivers* or *river dogs,* must try to find the key logs and break the jam. Sometimes dynamite is used.

Sawmills which receive logs from a river are usually located on a connecting lake, either natural or artificial. Here the logs are gathered and allowed to remain, confined by great boom logs which are chained together. Sometimes, if the mill is on a large lake, tugboats pull these great masses of logs to the mill. Today, however, river logging is gradually disappearing because of the cutting away of timber on river banks. Machinery is extensively used in the Far West to haul the logs, and most of the timber is shipped to the mills by rail.

In the mill there are many kinds of saws capable of reducing the logs to boards, shingles, and other material in short order. One of these, the gang saw, consists of a number of saws spaced the thickness of the board desired. These saws work vertically, and as a log passes through them, several boards are produced. All waste is used. The poor boards and slabs become lath; the bark, sawdust, and waste furnish fuel for the steam boilers which furnish the power for the machinery. The gases given off by the burning woods produce valuable by-products such as acetic acid, wood alcohol, and charcoal. Lumber taken straight from the sawmill is usually not good for building material. It will warp, since lumber shrinks in drying. The moisture in lumber is sometimes reduced by allowing the wood to season in open air. But more often, the lumber is seasoned in dry kilns, or ovens, for two to ten days, reducing the moisture content from about 50 per cent to 8 or 10 per cent.

After the wood has been seasoned, it is stacked in piles ready for planing. The planers operate at high speeds, surfacing all four sides of the lumber at one time. Small sizes of lumber pass through the planer at the rate of about 600 feet per minute. As boards of equal size come from the planer, they are piled one upon another until a bundle collects for tying. The finished lumber is then trimmed to length and stamped. Each customer's order is then carefully counted and loaded into ships or boxcars, or on trucks.

At least three fourths of the lumber produced and sold today comes from softwood. Most small lumberyards in the United States and Canada carry all softwoods required for ordinary building purposes.

Buying and selling lumber takes expert training. The dealer must be able to estimate the amount of usable lumber in a log, and a buyer should also know how much usable lumber there will be in the quantity of unsawed timber he is buying. Usually in the sale of timber, no charge is made for the waste left after sawing, but the price is fixed on the estimated board feet of lumber which will be produced.

For additional information, consult the articles on the various trees; BUILDING; FORESTS AND FORESTRY.

Georgia-Pacific Corporation

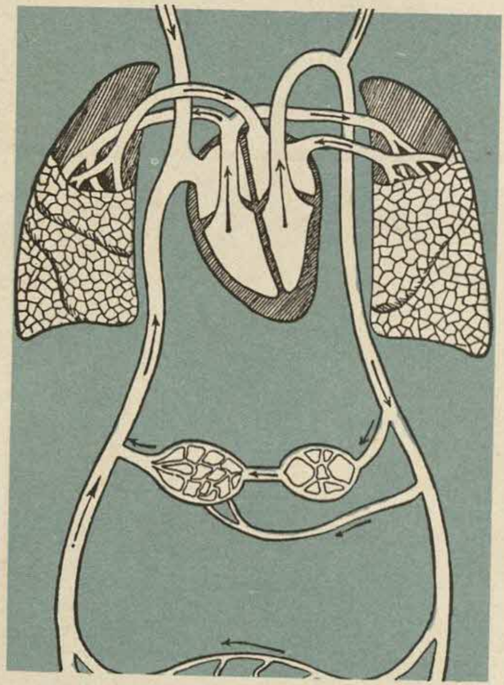
REDWOODS—SO BIG THEY MUST BE SAWED TO FIT ON FLATCARS

Many California redwoods being cut today started growing 1,400 years ago. From 200 to 300 feet high and 10 to 12 feet thick, a single tree yields enough lumber for many homes. Cutting mature trees gives smaller ones the necessary light and water for rapid growth and assures an increasing supply of lumber. Redwood is highly resistant to decay and insects.

FROM FOREST TO MILLPOND

Above, a skilled forester deftly marks a pine for cutting. Woodsmen will saw it so that it will not damage smaller trees when it falls. Right, logs are sorted by an experienced boomman at the millsite.

Weyerhaeuser Company



HUMAN AIR-CONDITIONING
It is the work of the lungs to supply the blood with oxygen. They do this by means of many tiny capillaries into which the blood flows once each time around the body.

LUNGS. Day and night, year in and year out, from the day a person is born until he dies, the lungs never cease their work of supplying the body with oxygen. The most important of the respiratory organs, the two lungs occupy the greater part of the chest cavity. In a man their weight seldom exceeds three and one-half pounds, and in a woman it is usually about two and three-fourths pounds.

Air reaches these organs through the windpipe, or *trachea,* which divides into the right and left bronchial tubes. These tubes enter the lungs about halfway between the top and bottom, and continue to divide and re-divide, conveying air to the millions of minute air sacs of which the lungs are made up. Covering each lung is a membrane known as the *pleura,* while a similar membrane lines the chest wall. These are moistened by a fluid, preventing friction during the respiratory movements.

The lungs also contain innumerable capillaries carrying the blood, as well as nerves and lymphatics. The lungs are pinkish in color at birth, growing mottled in middle age, and reaching a still darker tint in old age. The color is affected by dust and smoke in the air.

As the air is drawn into the lungs, the oxygen is separated, carried through the tiny cells into the blood stream, and thence to all parts of the body. On the return trip, the blood carries carbon dioxide, a waste material, back to the lungs, where it is expelled (see Breathing).

Occasionally, as in drowning, electric shock, or infantile paralysis, the lungs will refuse to function. In such a case, artificial respiration, pulmotors, or "iron lungs" must be used until normal operation of the lungs is restored.

Consult the following titles for additional information:

Circulation
Drowning
Heart
Physical Education

LUPINE, *lu'pin.* Often called by such common names as *Indian bean, wild bean, blue pea,* and *blue bean,* the lupine is a member of the pea family. Though found in Eastern United States, it thrives best in the Western states. Some species are cultivated as forage plants; others, especially in Europe, are raised chiefly because they add nitrogen to the soil; still other lupines are cultivated as ornamental shrubs. The blossom of the plant is pealike in appearance.

Like the loco weed, the lupines have caused much loss on the American sheep ranges (see Loco Weed). The seeds are distinctly poisonous, and animals which have eaten the pods of mature plants become frenzied and convulsive and have difficulty in breathing. There is no cure for the afflicted animals.

LU'THER, Martin (1483-1546). The foremost leader in the Protestant Reformation, Martin Luther was born in Eisleben, German Saxony, of a poor miner's family, but succeeded in securing an excellent education. A brilliant student at Erfurt, he

AN APOSTLE OF RELIGIOUS FREEDOM DEFIES THE OLD ORDER
Martin Luther was the moving spirit behind the Reformation; he defended his ideas at Worms.

saw a need for Church reform, both as a master of philosophy and as a monk in the Augustinian monastery. He was consecrated a priest in 1507, became a professor of philosophy at the University of Wittenberg, and later became a doctor of theology and district vicar of the Augustinians.

In 1517, Tetzel, a Dominican priest, appeared in Wittenberg to preach indulgences. Because there had been abuses in the sale of indulgences, Luther rebelled at this time and nailed upon the door of the church his famous ninety-five statements urging reform of the custom. These "theses" received immediate attention and aroused controversy throughout Europe. The Reformation was the result.

Luther was forced to defy the Pope, who issued a bull demanding that Luther recant; but the courageous monk publicly burned the document. Luther won many supporters in Germany, especially among the princes, who disliked the Pope's power. After the Diet of Worms in 1521, Luther again refused to recant. He believed that the councils of the Church were not infallible; that the Bible was the only foundation of faith; and that formal worship was unnecessary to salvation.

Luther had intended only to reform the Catholic faith. However, opposition in the Catholic Church forced the independent organization. Because he and his followers "protested" the power of the Church, they were called *Protestants.* In 1525 he married a former nun, Katherine von Bora. His German translation of the New Testament was published in 1522, and ten years later he completed the translation of the Bible. He was a writer of hymns, among them *A Mighty Fortress Is Our God.* See REFORMATION, THE.

LU'THERANS. In the days of the Reformation, the name Lutheran was applied to all those who followed the doctrines of Martin Luther. Today the Lutherans comprise a definitely organized Church.

The main tenet of the Lutheran belief is that salvation is achieved only by faith and that the Bible is the foundation of faith. The creed embodies a strict interpretation of the Bible.

In Germany, Denmark, Sweden, Norway, Finland, Estonia, and Latvia, Lutheranism is the predominant Protestant denomination. In the United States and Canada, all the Lutheran bodies have more than 7,000,000 members. See LUTHER, MARTIN.

LUX'EMBURG. Smaller than the state of Rhode Island, the little Grand Duchy of Luxemburg is nevertheless one of Europe's oldest states.

The duchy has an area just under a thousand square miles, and it borders on Belgium to the north and west, on Germany to the east, and on France to the south. It is governed by the Grand Duchess Charlotte and a Chamber of Deputies elected by universal suffrage. The population, which is largely agricultural, is about 301,000. Most of the inhabitants are Roman Catholics. French is the official language, although some German is spoken.

For over 400 years Luxemburg was a part of the Holy Roman Empire; later it was governed successively by Burgundy, Spain, Austria, and France, and became a grand duchy in 1815. From then until 1867 it belonged to the Germanic Confederation. In 1867 its independence was guaranteed by the Treaty of London, although economically it remained dependent on Germany. The nation was invaded by the Germans during World War I, but the people put up no resistance. Its independence after the war was affirmed in a referendum in 1919. In World War II, it was again overrun by Germany; its government ruled in exile.

The city of Luxemburg is the capital (population 62,000) and the home of the Grand Duchess Charlotte. She gained her throne through the abdication of her sister, Marie Adelaide, in 1919. Her husband is Prince Felix of Bourbon-Parma, and the heir to the throne is Prince Jean. The international business of the duchy is conducted through a customs union with Belgium.

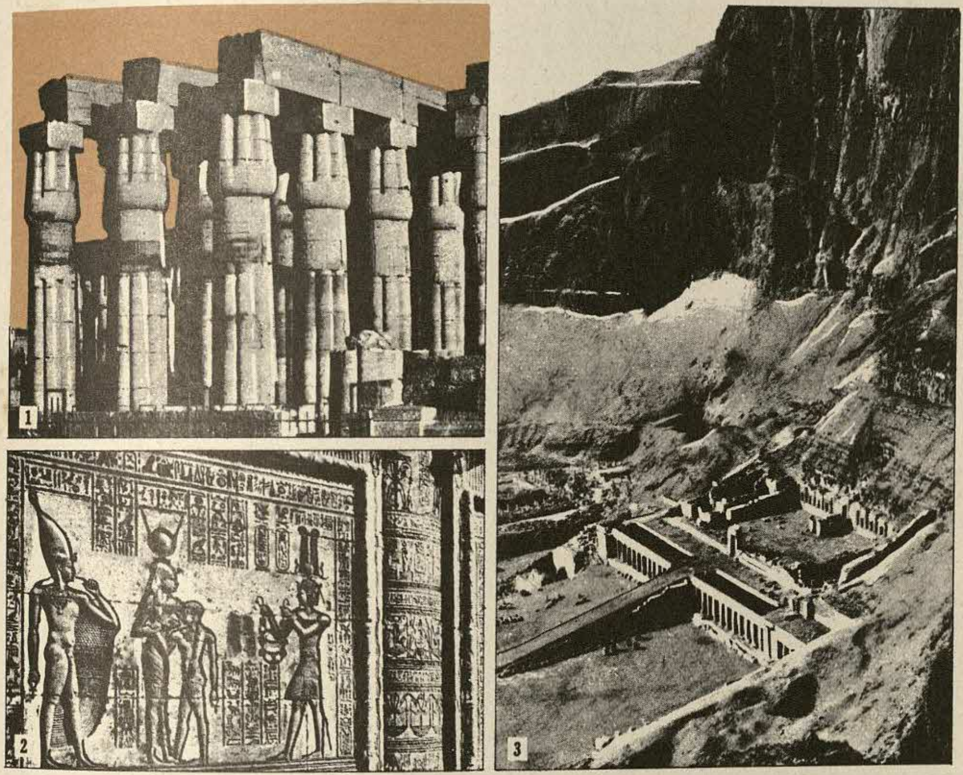
Luxemburg's production of iron is more than 5,000,000 tons a year—an output considered enormous for the nation's size. There are over 500 miles of railway, and the little duchy is very popular with tourists because of its flavor of antiquity and romantic history.

LUXOR, *luk'sawr,* EGYPT. Memories of ancient Pharaohs surround the village of Luxor, Egypt, located on the east bank of the Nile. Here may be found three great black granite statues of the powerful Rameses II, still standing guard. Ruins of a huge temple, built about the fifteenth century B. C. by Amenophis III, also stand as relics of the ancient Egyptian civilization. The Arabic name of this village, which stands on the site of famed Thebes, is El Upsor. See THEBES.

LYCURGUS, *li kur'gus.* About 900 B. C. the great lawgiver, Lycurgus, is supposed to have worked out the legal code of ancient Sparta which unified the nation and was probably the first attempt to promote the welfare of the state over that of the individual. Little is known of his life, except that he traveled in several Mediterranean countries gathering the ideas which he put into the constitution. See SPARTA.

LYMPH, *limf.* In the lymphatic vessels of the body there is a fluid, lymph, which is practically blood minus red corpuscles. Lymph has its origin in the passage through pores of blood serum. It is ordinarily clear and transparent. When in the course of its circulation it reaches those lymphatics called *lacteals,* it receives fat from the digesting food and becomes milky in appearance, the mixed materials being termed chyle. The *chyle* is conveyed through the thoracic duct and the right lymphatic duct to the subclavian vein, where it mingles with the blood; then, after passing through the lungs, it becomes blood in all respects.

LYMPHATICS, *lim fat'iks.* Just as the blood vessels form a minute network all over the body, so, too, do the lymphatics stretch out to the body's connective tissues. Minute, transparent tubes that are found



LUXOR'S SHATTERED RUINS TELL A THRILLING STORY

Two small towns on the Upper Nile, Luxor and near-by Karnak, occupy the site of ancient Thebes, where lived the powerful Pharaohs centuries before Christ. There stand the remnants of the works of the mighty dead: Amenhotep, Seti, Tutankhamen, Rameses II. (1) Colonnade. (2) Wall carvings, Luxor. (3) Temple of Hatshepsu.

everywhere in the body except in the eye, tendons, spinal cord, and brain, the lymphatics are so filled with valves that they appear to be knotted. These valves are especially numerous in the groin, armpits, neck, thorax, and abdomen. The lymphatics originate in the lymph capillaries.

The lymph, a colorless fluid for tissue repair and the storage of energy, eventually empties through the right and left subclavian veins into the blood stream.

LYNX, *lingks.* A wild, catlike animal is the lynx, found in North America, Europe, and the north-temperate regions of Asia. Two species occur in North America: the larger, northern species known as the *Canada* lynx, and the smaller, southern species known as the *bobcat, bay* lynx, or *wildcat.*

Both species have long legs, short, slender bodies, tufts of black hair on the tips of the ears, and short, stubby tails. Both prowl about at night in search of food—birds, mice, rabbits, squirrels, and other small animals, and sometimes poultry, sheep, hogs, and calves. Although lynxes usually seek their prey on the ground, they can climb trees quickly when pursued by dogs. As a rule they shy away from man, but they are capable of putting up a desperate fight when wounded, cornered, or forced to defend their young.

The weird, hideous cries and stealthy prowling of the lynx account for the terror with which the animal is usually regarded. When hunting, it crouches low, ready to pounce upon an unsuspecting victim, or creeps forward stealthily to spring or rush suddenly upon its prey.

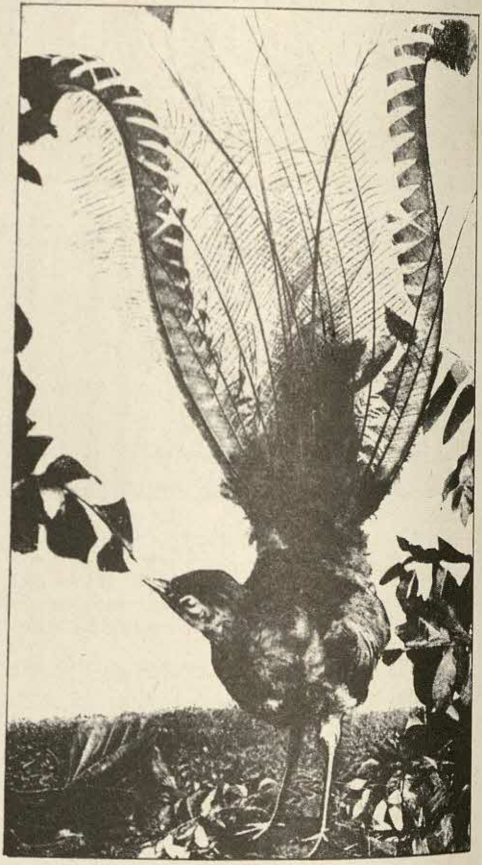
NORTH AMERICA'S WILDCAT
The lynx has beautiful fur and a fierce nature.

LYRE BIRD. Found only in Oceania, the lyre bird, of which there are but three species, seems strangely related to the peacock. It is so-named because of the lyre-like appearance of the male bird's tail. Brown in color, these birds are about the size of a hen. They live upon the ground, but can spring to branches of a tree several feet above the earth. When running, their tails spread out horizontally. In the breeding season, the male is very vain, strutting proudly with tail erect and singing a loud, but pleasing, song.

LYR'IC POETRY. Great literature abounds in lyric poetry, the type of verse which takes its place among the most beautiful styles of writing in any language. Lyric poetry, which received its name from ancient days when it was sung to the accompaniment of a lyre, differs from dramatic or epic poetry in that it does not necessarily have a plot or story. It must, however, express the thoughts of the poet or the emotions of someone else. The great lyric poets in English literature include Milton, Wordsworth, Tennyson, Byron, Shelley, and Keats. American lyric poets include Emily Dickinson, Elinor Wylie, and Edna St. Vincent Millay.

A fine example of lyric poetry is this passage from Tennyson's *Crossing the Bar:*

Sunset and evening star,
And one clear call for me!
And may there be no moaning of the bar,
When I put out to sea,
But such a tide as moving seems asleep,
Too full for sound and foam,
When that which drew from out the boundless deep
Turns again home.



AUSTRALIAN LYRE BIRD

LYSAN'DER (?-395 B. C.). Sparta assumed the mastery of Greece in the year 405 B. C. when Lysander, the commander of the city state's fleet, captured the Athenian fleet in a battle near Aegospotami. This battle ended the Peloponnesian War and Athens' leadership of the Greek cities. Lysander later was killed in a battle with the Thebans. The city state of Thebes succeeded Sparta as the leading state.

M. When the Phoenicians wished a symbol for water for their alphabet, they drew a wavy line to represent the rippling motion of the sea, like this, 𐤌 . This symbol has come down to us as the thirteenth letter of the alphabet with little change, for *M* still resembles a wavy line. The early Greeks, who wrote from right to left, made the letter this way, 𐌌 . Later, when the Greeks wrote from left to right, they made the letter Μ . The Romans wrote it *M,* and that is the form passed down to us.

MACAD′AM. See ROADS AND STREETS.

MacARTHUR, DOUGLAS (1880-). As Supreme Commander of the Allied Forces in the Southwest Pacific, Five-Star General MacArthur, the heroic defender of Bataan, helped to plan and bring about Japan's defeat in World War II. As was fitting, he accepted the enemy's surrender aboard the *Missouri* and commanded the occupation of Japan. He also commanded the United Nations forces in the Korean War from 1950 until he was removed for his outspoken opposition to his government's policies. Returning home in 1951, he received a hero's welcome, then became a corporation executive.

Signal Corps Photo

HERO OF THE PACIFIC THEATER
General MacArthur directed the defeat of Japan.

Born in Little Rock, Ark., and educated at West Point, MacArthur first won fame as Commander of the "Rainbow" Division in World War I, then was West Point's youngest superintendent, the United States Army's youngest Chief of Staff, and the organizer of the Philippine defenses. Although he retired in 1937, he was recalled to duty in 1941 and, as Commander of the United States Army in the Far East, started his illustrious World War II career. See LITTLE ROCK; WORLD WAR II.

MACAULAY, *ma kaw′ ly,* THOMAS BABINGTON (1800-1859). Although he was a noted British statesman of his day, Macaulay is chiefly remembered as an essayist, historian, and poet. His greatest work, *The History of England from the Accession of James II,* and his *Essays* (collected) are written in the brilliant style for which all his prose is still famous. Best known of his poetry is his *Lays of Ancient Rome.* Born at Rothley and educated at Cambridge, he was made Baron Macaulay of Rothley two years before his death. He was buried in Westminster Abbey.

MACAW′. Native to South and Central America, macaws are large, brilliantly colored parrots having long, wedge-shaped tails, long, pointed wings, powerful claws, and high, arched beaks. Their plumage is in combinations of blue, red, yellow, and green.

Macaws are easily tamed but difficult to teach to speak. They are strong in flight, utter hoarse, screaming notes, and feed upon fruits and seeds. They are most prized for their brilliant coloring.

MACBETH′ (?-1057). Shakespeare's famed tragedy, *Macbeth,* is based on the legends which surrounded an eleventh-century king of Scotland. History records that he killed Duncan, the king, in 1040 and seized the throne, only to be killed himself by kinsmen of Duncan in 1057. Shakespeare's immediate source was Holinshed's *Chronicles of Scottish History,* in which the tale is related.

McCLEL′LAN, George Brinton (1826-1885). Of the several Northern generals who commanded the Army of the Potomac in the Civil War, George B. McClellan was the second. The system of training which he introduced was one of the most important factors in victory for the Union.

A native of Philadelphia, he was trained at West Point and later served in the Mexican War. He became a major general when the Civil War broke out, and later took command of the Army of the Potomac from McDowell. Defeated by Lee in the campaign of 1862, he was replaced by General John Pope, but soon won back his position. McClellan managed to check Lee at Antietam in September, 1862, but, for his failure to pursue the Confederates, he was again removed.

McClellan unsuccessfully opposed Lincoln for the Presidency in 1864 as the nominee of the Northern Democrats. In 1877 he was elected governor of New Jersey.

McCOR′MICK, Cyrus Hall (1809-1884). Not often does one invention revolutionize an industry so completely as Cyrus Hall McCormick's mechanical reaper altered methods of farming. This invention enabled farmers to raise bigger crops, made farmers less dependent on labor and weather conditions, and opened new farming areas for development.

Born in Walnut Grove, Va., McCormick worked on his father's farm, where he became interested in the invention of a reaper after his father's attempts in the same direction had failed. The invention was completed in 1831. In 1847 McCormick established in Chicago a factory which later became a part of the great International Harvester Company. He used part of his wealth to further education, establishing the McCormick Theological Seminary in Chicago.

MACDONALD, John Alexander, Sir (1815-1891). Canada's present status as a Dominion is due largely to the efforts of Sir John A. Macdonald, first Premier of the great British possession. Born in Glasgow, Scotland, he was taken to Kingston, Ont., by his family when he was five years old. After becoming a lawyer, Macdonald began his political career with his election to the Ontario assembly in 1844.

As a member of the Conservative party, he rose rapidly in provincial affairs and in 1857 became premier of Ontario. Seven years later he was one of the leaders of the conference between officials of Ontario, Quebec, and the Maritime Provinces to discuss the formation of a union; as a result, the British North America Act of 1867, Canada's Constitution, was brought into being. The Dominion of Canada having been formed, Macdonald became its first Premier.

Faced with innumerable problems, he set about purchasing the Northwest Territories from the Hudson's Bay Company and constructing a transcontinental railroad. Scandals in connection with the latter enterprise caused his resignation in 1874, but four years later he was back in power and finished the railroad. He remained Premier until his death in 1891. One of his outstanding accomplishments was the creation of the Royal Northwest Mounted Police (now the Royal Canadian Mounted Police), the efficient organization that is famous for its strict enforcement of the law in the wilderness of Canada's outlying territory.

MacDOW′ELL, Edward Alexander (1861-1908). An American composer of great originality, Edward MacDowell made wide use of American folk music, chiefly Indian, in his musical works. Outstanding are his *Indian Suite* for orchestra and his *Woodland Sketches* for piano. Recognized as one of the foremost composers in the United States, MacDowell was born in New York City and received his musical education in France and Germany. He made occasional appearances on the concert stage as a pianist, and from 1896 to 1904 was head of the music department of Columbia University.

MACEDONIA, *mas e do'ni ah.* Back in the days of Alexander the Great, Macedonia was the center of a great empire. Today there is no such country as Macedonia, although the name is still sometimes applied to the part of Greece and Bulgaria lying south and west of the Rhodope Mountains.

The early Macedonians are believed to have been a tribe of Greeks who held this land when the other tribes invaded Greece. Their customs and language differed so from those tribes that the Macedonians were considered a separate people.

Macedonia first sprang into prominence when Philip II became king in 359 B. C. Under his rule Macedonia conquered the Greek states; and under the rule of his son, Alexander the Great, the empire was extended so that it included Greece, Egypt, and territory in Asia from the Mediterranean to Northern India. After Alexander's death, the empire was divided among his generals.

Macedonia was conquered by the Romans in 146 B. C. and was made part of the Byzantine Empire when the Roman Empire was divided about 500 years later. When the Byzantine Empire crumbled, Macedonia fell into the hands of the Turks, who held it until the end of the Balkan Wars. In 1913, when these wars ended, Macedonia was divided among Greece, Bulgaria, and Serbia. Much fighting took place there during World War I, and Allied victories in Macedonia in 1918 paved the way for the downfall of Bulgaria.

Consult the following titles for additional information:

Alexander the Great
Demosthenes
Greece
Philip II
Philip II (of Macedonia)
World War I

MACHIAVELLI, *mah kyah vel'le,* NICCOLO (1469-1527). This noted Italian statesman and author is today best remembered for his philosophy that in politics the end justifies the means. The term *Machiavellian* was derived from this theory and implies the unscrupulous use of power. The theory was outlined in a book entitled *Il Principe* (The Prince), in which Machiavelli advocated the unification of Italy by a prince who would let nothing stand in his way.

A native of Florence, he virtually ruled the Florentine republic for fourteen years. In 1512, when the Medici regained power, the brilliant philosopher was removed from office. Among his writings are the *History of Florence* and the comedies *La Mandragola* and *La Clizia.*

MACHINE, *ma sheen'.* Created by man, but yet his master, the machine is the basis of the industrial age existing today in the United States and other progressive nations. As a device that performs work, it may be as simple as a pencil sharpener or as complicated as a huge dynamo; but, regardless of its nature, the machine is at the root of all the benefits and hardships that modern industry has given the world.

So many machines have been invented in the past 150 years that the period has justly been called "the machine age." But there were machines before the eighteenth century. The wheel, the lever, and the screw, all fundamentals of machinery, were in use for ages. It is from the time of the invention of the steam engine by James Watt that we begin the machine age, however. This invention completely revolutionized society, speeded up transportation, and quickened the pace of the world. Inventions since that time have further increased the use of mechanical devices, and the electrical contributions of Thomas Edison added still more to the machinery used in the factory, the home, for transportation, and in practically every field of endeavor. Some of the most valuable machines include, besides the steam engine and electric motor, the gasoline motor, mechanical office and home devices, and the reaper.

See also Industrial Revolution; Invention; Labor-Saving Devices.

MACHINE GUN. First widely used in World War I, the rapid-firing, mechanically operated machine gun revolutionized modern warfare. It was not only responsible for the adoption of the trench fighting of that conflict and for ending the mass infantry and cavalry attacks of earlier times, but it also made necessary the development of tanks and other armored vehicles. In addition, it played an important part in making air warfare effective. By the start of World War II, the machine gun had become the major offensive weapon of armored vehicles and a chief defense against them, as well as the principal ground defense against warplanes and, except for bombs, their only offensive weapon.

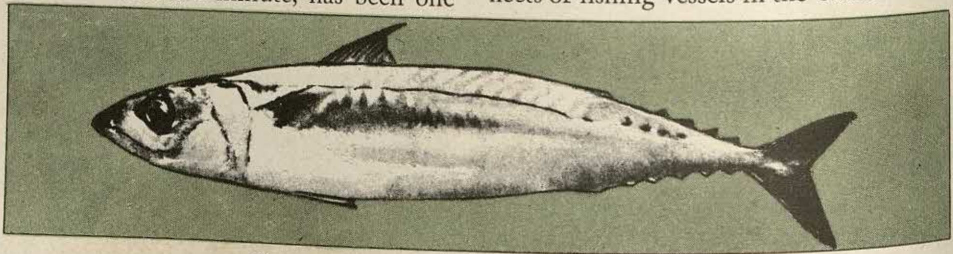
The first successful machine gun was invented by an American in 1861. It was named for its inventor, Richard J. Gatling. The first in Europe was the French *Montigny Mitrailleuse,* which was used in the Franco-German War. The first entirely automatic gun, however, was the Maxim, invented by Hiram Maxim, an American, in 1883 and soon adopted by the British army. Since then, many improved models have been developed in various countries. From the Maxim came the British recoil-operated, belt-fed Vickers. The air-cooled or water-cooled .30-caliber Browning, firing about 500 rounds a minute, has been one of the most useful weapons of the American army. A .50-caliber model is mounted on tanks and aircraft and in antiaircraft emplacements.

There is a great variety of lighter automatic weapons, some of which have tripods like the early machine guns and others of which may be fired from the shoulder like rifles. The British Bren and the American BAR (Browning automatic rifle) are gas-operated. Pistol cartridges are used in guns like the Thompson, a submachine gun, and the Sten, a machine carbine. Automatic and semiautomatic rifles are now common. See World War (I, II).

MACKEN'ZIE RIVER. Flowing through Western Canada is the great Mackenzie River, second longest in North America. Navigable throughout most of its course of 2,525 miles, it includes the Peace, Slave, Liard, and the Peel rivers, as well as others, and empties into Beaufort Sea, a part of the Arctic Ocean. It is named for Alexander Mackenzie, who discovered it in 1789.

MACKEREL, *mak'ur el.* With their trim bodies and mottled backs, mackerel are beautiful fish. They have, besides two prominent back fins, a number of smaller fins just in front of the tail. Small mackerel less than a year old are known by fishermen as *spikes. Blinkers* are year-old mackerel, and *tinkers* those that are two years old. Mackerel probably mature when about three years old, and then weigh from one to three pounds. Large mackerel lay as many as 1,000,000 eggs each.

Mackerel are among the most valuable of the fishes of the sea, and support many fleets of fishing vessels in the United States,



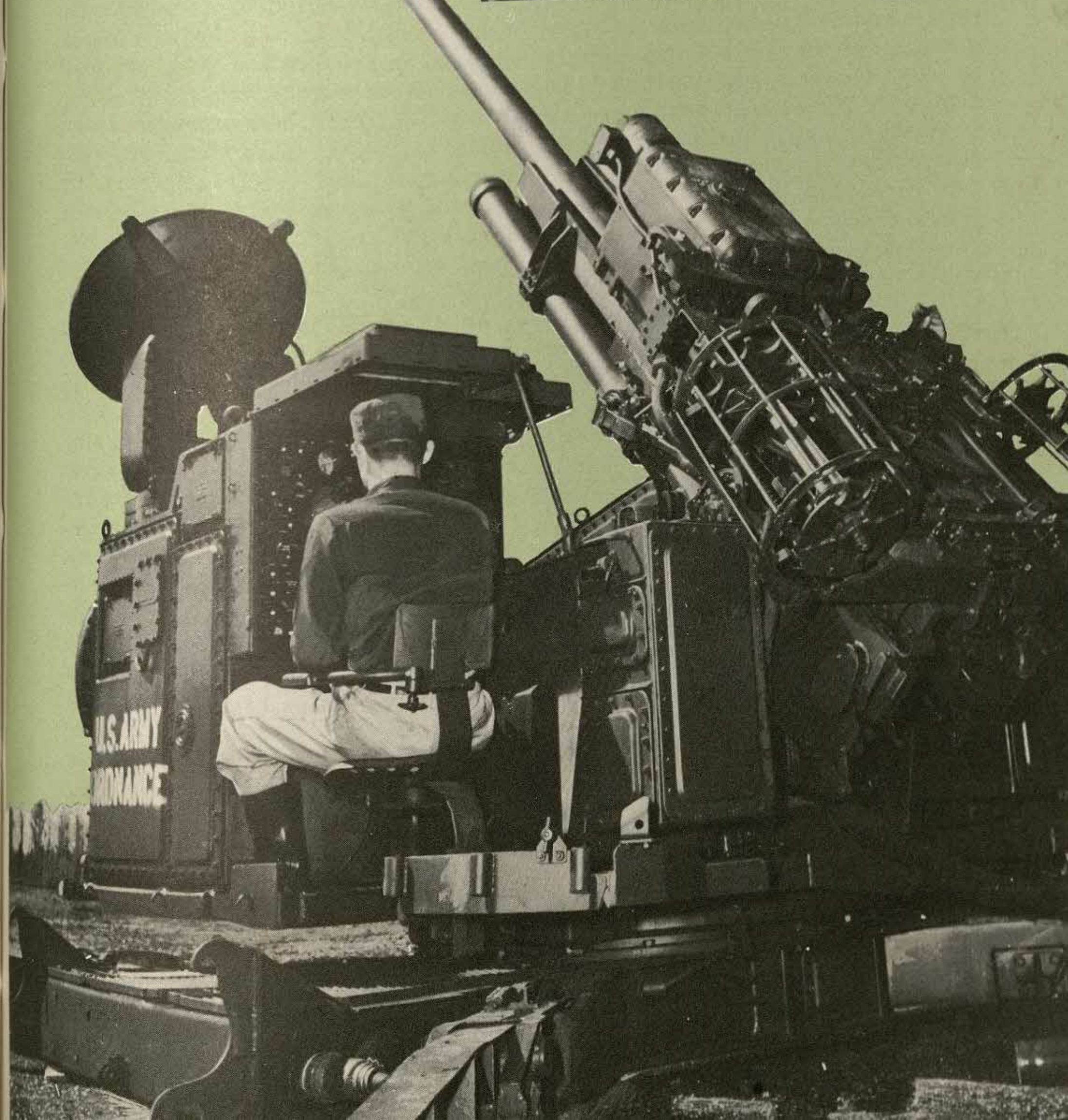
HEALTHFUL BOUNTY FROM THE SEA

Mackerel, which make fine food, are caught in drift nets, which trap them by the ton.

U. S. Army Photographs

MONSTER MACHINE GUN

The machine gun below is the 75-mm Skysweeper, used as an antiaircraft weapon. At right are infantry machine gunners, firing from ambush.



Canada, and Europe. They are found in the Atlantic Ocean and in the Adriatic and Mediterranean seas. Like menhaden and herring, they swim in great schools and are preyed upon by larger fish. Schools of mackerel feed upon schools of menhaden and larger fishes, while bluefish, cod, and sharks are among their enemies.

Spanish mackerel are larger and are found on both the Atlantic and Pacific coasts. They weigh eight or nine pounds and are an excellent food fish. The *horse* mackerel, or *tuna,* is the largest of the family. See TUNA.

MACKINAC, *mak'in ak,* **ISLAND.** In the Strait of Mackinac at the northwestern tip of Lake Huron is Mackinac Island, long the chief French stronghold of the Old Northwest. For years Mackinac was the fur-trading center of the region and the natural stopping place for the Saint Lawrence-Great Lakes traffic. It is a part of Mackinac County, Mich., contains about six square miles, and is a state park. At its south end, where it rises sharply from the lake, there is a high cliff, the site of old Fort Mackinac. This fort, important in the War of 1812, has long since been abandoned. At the foot of the bluff lies the town of Mackinac, which has become a popular summer resort.

McKIN'LEY, MOUNT. Towering 20,300 feet above sea level in the south-central part of Alaska is Mount McKinley, the loftiest peak in North America. It is eternally snow-covered and has large, dangerous glaciers. It was first ascended in 1913 by Hudson Stuck and three companions.

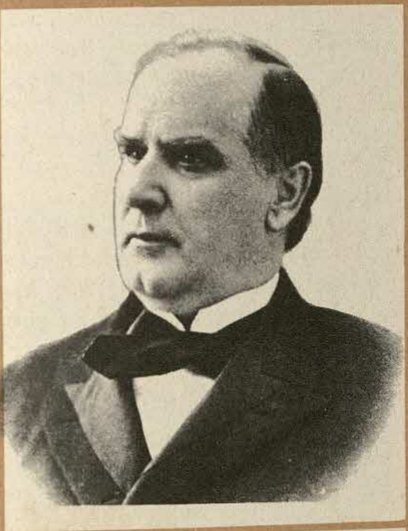
McKINLEY, WILLIAM (1843-1901). The United States first gained recognition as a world power during the administration of William McKinley, twenty-fifth President. The President was an honest, likable man, one whom the public sincerely respected, and to him cannot be laid the sole responsibility for the change of national policy. McKinley was subject to pressure and influence which had behind it the rallying support of the people. This period was also the era of high tariffs and of discontent among the silver states of the West.

Early Life. McKinley was born at Niles, Ohio, on January 29, 1843, of a family of iron industrialists. The boy worked in the iron foundry for a time and received his education at the Poland (Ohio) Seminary and at Allegheny College, Meadville, Penna., but was forced to discontinue his studies at the college on acount of poor health.

He served in the army during the Civil War and was rewarded for gallantry with the rank of brevet major. Returning to Poland at the close of the war, the young officer studied law and was admitted to the bar in 1867. Moving to Canton, Ohio, he engaged in politics of a minor sort until 1876, when the Republicans of the state sent him to Congress. There he remained until 1891. While in Congress, McKinley gained prominence as an advocate of high tariffs, and aroused country-wide discussion over his tariff bill of 1890. Retiring from Congress, he was twice elected governor of Ohio.

As President. In 1896 the Republicans nominated McKinley to oppose William Jennings Bryan, one of the greatest orators and most popular men of the century. Bryan represented the West, the working classes, and those who favored free coinage of silver, but lost the support of the "gold Democrats" of his party. McKinley, with the aid of a strongly organized party, corporation interests, and voters who favored a sound gold-money policy, won the election by a comparatively narrow margin of 567,692 votes. It was an election concerning which it has been said, "It took 18,000 speakers to defeat one silver-tongued Democrat."

McKinley's first administration was one of revolutionary national policy. The prosperity of 1896, due to a turn in the economic cycle rather than to the administration, won for the new President the support of the people, and the Dingley Bill, providing for higher tariff rates, was hailed as the protector of prosperity, finding little congressional opposition. The economic issues of labor, silver, and big business soon became overshadowed by the prospect of war with Spain. The sugar and commercial interests, newspapers, and sympathetic citizens who felt it the duty of the United States to liberate the Cubans from oppression, all favored the war. Spain's offers of peaceful settlement fell on deaf ears when the battleship *Maine* was sunk in Havana harbor. The war was short and decisive. The Philippines and Puerto Rico were added to the American domain; Cuba was freed, although under the Platt Amendment and the ensuing treaty, the new republic agreed to permit the United States to intervene in Cuban affairs in cases of emergency.



WILLIAM McKINLEY
Twenty-fifth President of the United States
Administration: 1897-1901
During McKinley's administration the United States, through the Spanish-American War, first gained recognition as a world power.

At the close of the century, gold was made the official standard of money, and Secretary of State Hay inaugurated the open-door policy of trade in China, which not only opened new markets to the rising world power, but curbed a serious Chinese revolt against foreign commercial concessions. In 1898 the Hawaiian Islands were annexed to the United States.

The election of 1900 showed increased popularity for President McKinley. Mark Hanna, heading the campaign, gave full credit for the prosperity and the successful war to the President and the party, and cleverly used the slogan of "the full dinner pail" to win the workingmen's vote. Bryan was again the Democratic candidate.

During the first year of McKinley's second administration, the Supreme Court approved the acquisition of possessions. Spain was paid $20,000,000 for the Philippines. On September 6, 1901, President McKinley was shot while attending the Pan-American Exposition in Buffalo. He was buried in Canton, Ohio. Vice-President Theodore Roosevelt became the next President. See BRYAN, WILLIAM JENNINGS; CUBA; SPANISH-AMERICAN WAR.

McREYNOLDS, *mak ren' uldz,* JAMES CLARK (1862-1946). An Associate Justice of the Supreme Court from 1914 until his retirement in 1941, James Clark McReynolds first entered government service in 1903. Born in Elkton, Ky., McReynolds practiced law in Nashville, Tenn., and in 1903 was appointed Assistant Attorney General of the United States in President Theodore Roosevelt's administration. He served in this post until 1907, after which he was employed as a special Assistant Attorney General in many of the anti-trust cases. In 1913 President Wilson selected him as Attorney General, and in the following year he was appointed to the Supreme Court.

MADAGAS'CAR. Lying in the Indian Ocean, 240 miles across the Mozambique Channel from the southeastern coast of Africa, is Madagascar, fifth largest island in the world, now called the Malagasy Republic. Irregular in shape, Madagascar has an area of 241,094 square miles and a population of about 4,913,000 inhabitants, of whom about 4,850,000 are Malagasy, the remainder being French and other Europeans. These Malagasy, the native people of Madagascar,

THE TROPICS IN THE ATLANTIC
Madeira is an island off the west coast of Africa, which attracts many vacationers.

speak a Malayan tongue and are divided into tribes, the most important of which is the Hova.

The island is completely surrounded by a low coastal plain, rising to a mountainous interior plateau several thousand feet high. The climate is tropical along the coast and temperate in the interior. The rivers are short and unimportant.

The natives live in frame houses with high roofs or in huts of bamboo or clay. They are skilled in the arts of silverworking, carpentry, and gunmaking. Beautiful cloths are woven on crude, handmade looms. The religion of the island is principally fetishism, the worship of charms, although among the Hovas, Christianity has been generally adopted. Education is compulsory for children between eight and fourteen years of age, and all pupils are required to learn the French language. The government is headed by a high commissioner, a council, and representative and provincial assemblies. The capital and largest city is Tananarive (Antananarivo), in the interior; the chief seaport is Tamatave, on the east coast.

Farming and grazing are the chief occupations. Leading crops include rice, coffee, cassava, cacao and other beans, peanuts, sisal, tobacco, sugar cane, cotton, coconuts, spices, bananas, corn, and sweet potatoes. Hump-backed cattle, sheep, goats, and pigs are raised. From the island's extensive forests come raffia, rubber, bamboo, cabinet woods, gums, resins, tannins, and medicinal plants. Graphite and mica are the most important minerals; others include phosphates, precious and industrial stones, radium, uranium, gold, and rock crystal. Food processing, textile manufacturing, and other industrial activities are developing, aided by the expansion of transportation facilities, which include highways, airlines, railroads, and shipping.

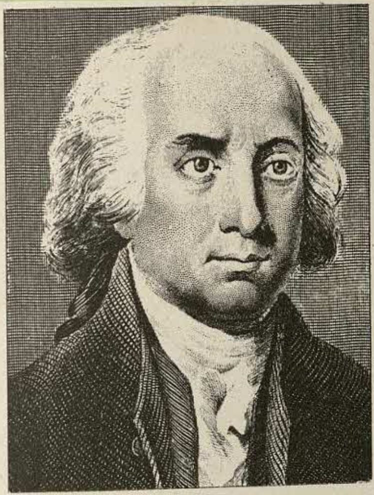
History. Discovered by Portugal's Diego Diaz in 1500, Madagascar was more or less independent and had its native rulers until 1885 when French troops conquered it, exiled its queen, and made it a French protectorate. In 1896 the island, with dependencies, became a French colony. During World War II, British and Free French forces occupied the island to keep the Japanese from capturing it. In 1946 Madagascar and its dependencies became a French overseas territory. The dependencies include the Comoro and Mayotte islands and others close by, several Antarctic islands, and vast areas claimed by France near the South Pole. In 1958 Madagascar became a republic within the new French Community, with representatives in the National Assembly.

MADEIRA, *made'rah.* Famous for its fine wines, Madeira, largest of the semi-tropical Madeira Islands, is equally famous as a health resort. It lies about 400 miles off the coast of Morocco in the Atlantic Ocean and has an area of nearly 315 square miles. Forming the backbone of the island is a central mountain system, the highest point of which is 6,000 feet above sea level.

Besides its wine, Madeira is noted for its beautiful scenery and hand embroidery. With Porto Santo and several uninhabited islets, it is an integral part of Portugal. Funchal is the capital. Discovered in the 1400's, the Madeiras have some 280,000 inhabitants, mostly of mixed Portuguese, Moorish, and Negro descent.

MAD'ISON, James (1751-1836). As "the Father of the Constitution" and as one of the ablest and most constructive thinkers during the Revolutionary period, James Madison deserves best to be remembered. It is true that he was the fourth President of the United States, but his executive ability fell short of his other qualifications.

The son of fairly well-to-do parents, James Madison was born at Port Conway, Va., on March 16, 1751, and was educated at the College of New Jersey, now Princeton University. Following his graduation he pursued his studies in constitutional law, preparing himself for a political career which was to be of inestimable value to the nation then just beginning its struggle for freedom. In that struggle he was a leader.



JAMES MADISON
Fourth President of the United States
Administrations: 1809-1817
The final conflict between the United States and Great Britain took place during Madison's eventful administrations.

Political Career. Madison received his early experience in various minor offices and as a member of the Virginia Constitutional Convention, where he made known his strong democratic tendencies and became closely allied with Thomas Jefferson. In 1780 Virginia sent him to the Continental Congress. From 1784 to 1787, Madison devoted his energy to solidifying sentiment in the colonies for a strong union, and by 1787 he was a prominent figure in the Constitutional Convention, acting as its secretary. He had a leading part in the drafting of what the famous British statesman, William Gladstone, almost a century later described as "the most wonderful document ever struck off by the hand of man."

The plan of congressional representation on the basis of population was adopted at Madison's suggestion, but only after a compromise was reached, whereby each state was allotted two Senators regardless of population. Together with Hamilton and Jay, Madison wrote a convincing series of essays on the merits of the Constitution. They were published in *The Federalist* and aided in bringing about the ratification of the document.

When elected to the first House of Representatives in 1789, Madison was a Federalist, but he found himself more and more in sympathy with Jefferson and soon aligned himself with the Anti-Federalists. Upon Jefferson's election in 1801, Madison was chosen Secretary of State. In that position he had the difficult task of maintaining diplomatic relations with both France and England, which were at war, and of upholding the rights of freedom of the seas for a neutral nation.

The Administrations of Madison. Madison was elected for two administrations, serving from 1809 to 1817. During his first term the almost hopeless negotiations were continued with France and England. The impressment of American seamen by the British continued to be a sore point. With a poor Cabinet and an equally inefficient diplomatic corps, Madison succeeded in doing little except increasing the tension among the three countries. The commercial interests in America did not desire a conflict; but national pride and even some hope of annexing Canada were strong arguments brought to bear on the President. Henry Clay and John Calhoun were already influential leaders, and they did all in their power to force the United States into war.

In spite of Britain's willingness to cooperate in settling the commercial dispute, war was declared—one which might have been avoided had there been a transatlantic cable (see WAR OF 1812). The ensuing conflict brought victory for neither side and both were glad to sign a treatv of peace at Ghent on December 24, 1814.

Madison was re-elected in 1812 on the strength of his support of the war. The Anti-Federalist party had moved toward the position of the Federalist. That party had become very weak, and by the end of the administration, there was practically only one party. It was the beginning of the "era of good feeling." In 1814 the Hartford Convention had been called by the Massachusetts legislature for the purpose of arranging a second Constitutional Convention to revise the original document. The attitude of the Federalists at the convention, wrongly interpreted as implying secession, hastened that party's disintegration.

During his last year in office, Madison approved the charter of the second United States Bank, continuing the centralized banking system, and also signed a protective tariff measure for the benefit of American manufacturing. He vetoed an appropriation of Congress for public roads and other improvements. Under the leadership of the President's gracious hostess, "Dolly" Madison, Washington society gained a prestige comparable to that of the capitals of Europe.

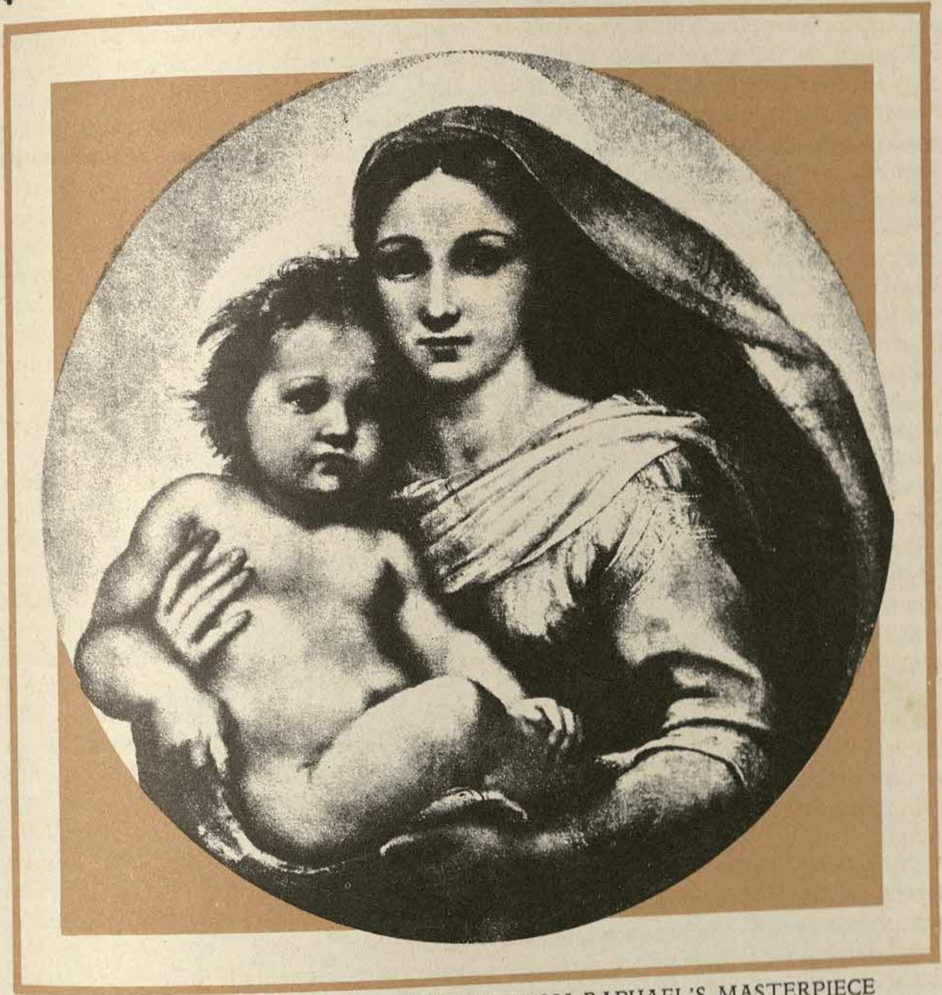
At the end of his second term, Madison returned to "Montpelier," his home in Virginia, where he spent the last twenty years of his life. See CONSTITUTION OF THE UNITED STATES; FEDERALISTS; HARTFORD CONVENTION.

MADISON, WIS. In the midst of the rolling green hills of Southern Wisconsin and almost entirely surrounded by four beautiful lakes lies Madison, capital of Wisconsin and county seat of Dane County. The city was founded in 1837 and derives its name from the fourth President of the United States. It is strategically located for commerce, lying but eighty-three miles west of Milwaukee and 130 miles northwest of Chicago.

The city is noted as an educational center, for it is the home of the University of Wisconsin, an outstanding state university. The library of the State Historical Society and the University Library contain more than a million volumes, and there are, besides, the legislative and Carnegie libraries. Outstanding among the city's structures is the state capitol. Madison has sixteen parks, with a combined area of 500 acres.

The city is industrially important for the manufacture of electrical apparatus, glass building materials, tools, gas engines, and farm machinery. Population, about 128,000.

MADON'NA. The subject of many of the world's most beautiful and best-loved paintings is Mary, the mother of Jesus. In



THE SISTINE MADONNA: A DETAIL FROM RAPHAEL'S MASTERPIECE

these paintings she is referred to as the Madonna (Italian for *my lady*). The Madonna was painted by many artists; but during the Middle Ages, when much of the art was religious in nature, the number of such paintings increased tremendously, although they remained rather crude and formal. It was not until the Renaissance that portrayals of the Virgin Mary became more natural and real, and it was during this period that most of our great Madonnas were painted.

The best Madonnas were done by the Italian painters, of whom Raphael is the greatest. Others of this group are Fra Filippo Lippi, Botticelli, Leonardo da Vinci, Bellini, and Titian. Artists of other nationalities did not paint the Madonna so frequently, but there are several fine examples by the German artist, Hans Holbein; by Rubens and Van Dyck of the Flemish school; and by Murillo of Spain.

Raphael's most beautiful Madonna is the noble and dignified *Sistine Madonna,* now in the Dresden Gallery, Germany. Among his others are *Madonna di Ansidei,* in the National Gallery, London; *La Belle Jardinière,* in the Louvre, Paris; *Madonna of the Chair,* in the Pitti Palace, Florence; and the *Madonna Colonna,* in the Metropolitan Museum, New York. Other famous Madonnas are Correggio's *Holy Night,* in the Dresden Gallery; *Madonna of Burgomaster Meyer,* by Holbein, in the Dresden Gallery; and Titian's *Pesaro Madonna,* in the Church of the Frari, Venice. See JESUS CHRIST; MARY, THE VIRGIN; PAINTING.

MADRID, *ma drid',* SPAIN. On a high plateau approximately in the center of Spain stands Madrid, the nation's capital since 1560 and its largest city. A busy, modern metropolis, having a subway, streetcars, and buses, broad, tree-lined boulevards, and handsome plazas, parks, fountains, and buildings, it is Spain's rail, air, highway, cultural, and political hub. In addition, it is an important trading and industrial center.

Among the city's many attractions are its fine museums, especially the Prado, one of the world's greatest art galleries; the world-famous National Library; the sumptuous National Palace; the University of Madrid, one of Europe's largest; and the Plaza de Toros, scene of the bullfights for which Madrid is also famous. Other notable buildings include skyscrapers, churches, and the opera house. Tourists also delight in visiting the city's old, picturesque sections and in watching the creaking oxcarts and heavily laden donkeys that bring vegetables from the surrounding countryside to Madrid's colorful markets. From the city they also go out some thirty miles to see the gigantic Escorial, the old royal palace, monastery, church, and tomb of many Spanish kings.

A Moorish military post in the 900's, Madrid was taken by the Spaniards in the next century. During the Civil War of 1936-39, it was long besieged and violently fought over before its surrender ended the conflict. The population of Greater Madrid is about 1,870,000.

MAETERLINCK, *may' tur link,* MAURICE (1862-1949). Strange and symbolic characters live in the dramas of Maurice Maeterlinck, outstanding Belgian poet and dramatist. Though many of his works are more enjoyable to read than to see performed, few modern writers have contributed more charm and beauty to the theater. Especially delightful are his *Pelleas and Melisande* and *The Blue Bird.* Some of his other plays include *Monna Vanna, The Princess Maleine, The Blind, The Intruder,* and *The Betrothal.* Besides works for the theater, Maeterlinck also has written a number of essays, some of which are based on his studies of natural life. These include *The Treasure of the Humble, Wisdom and Destiny, My Dog,* and *The Life of the Bees.* Maeterlinck was honored in 1911 when he was awarded the Nobel Prize for Literature.

MAG'DALENE, or MAGDALEN, MARY. Venerated as a Christian saint, Mary Magdalene appears in the New Testament as the woman who watched the Crucifixion and who went to Christ's tomb early on the morning of the resurrection to find it empty and to be told that Christ had risen. She is thought to have lived in Magdala, a small town on the Lake of Galilee.

MAGELLAN, *ma jel'an,* FERDINAND (about 1480-1521). Sailing under the flag of Spain, this Portuguese explorer won lasting fame as the first man to sail around the world. The log of his last voyage was a thrilling story of mutiny, desertion, disastrous storms, heat, cold, hunger, thirst, scurvy, and fighting. But the voyage was completed, despite the loss of its leader, proving beyond all question that the world is round and that America is not a part of Asia.

Magellan was of noble birth. He entered the service of the Portuguese crown, and in 1505 made a voyage to the East by way of the Cape of Good Hope. He was wounded in India, and in 1512 returned to his native land. The following year he was wounded again in Morocco. A false report concerning him reached the king, and Magellan left the country, renouncing his citizenship.

Going to Spain in 1514, he enlisted the aid of prominent men for a voyage westward to the Indies. Magellan secured a fleet of five old ships, and left Seville on

MISFORTUNE FOLLOWS MAGELLAN
The great explorer lost most of his fleet on his trip. The *Santiago* went on the rocks.

August 10, 1519. Sailing southwest, the fleet sighted Pernambuco on November 29, and Magellan headed south along the coast of South America. The crew wintered at Port Saint Julian, where a mutiny occurred; but it was quelled, and when spring came, the fleet set sail for the south.

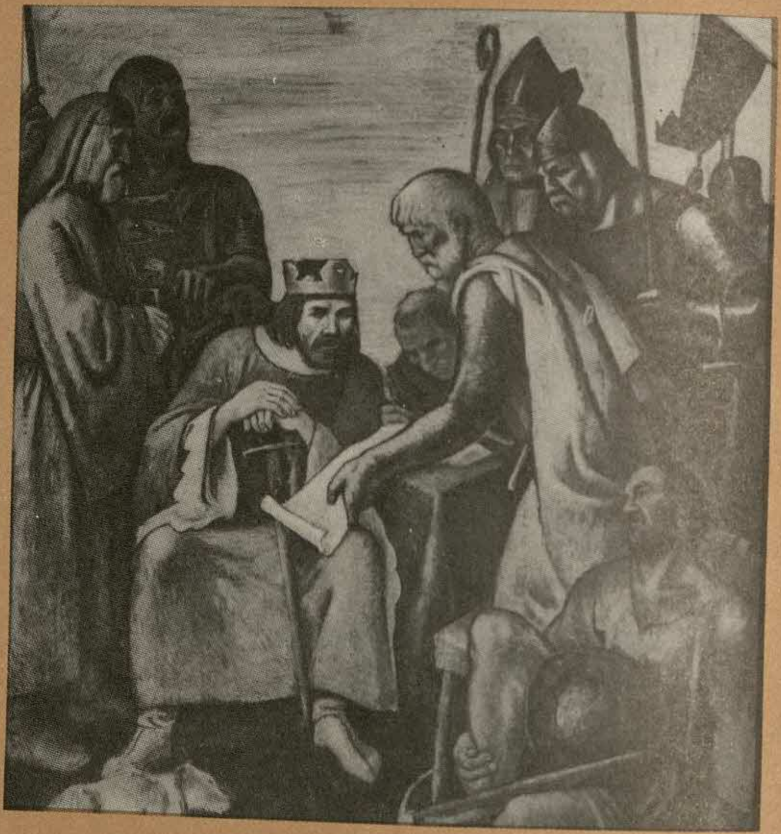
On October 21, 1520, the eastern entrance of the strait named for Magellan was sighted at the southern end of the South American continent, and for thirty-eight days the ships battled storm, wind, and heavy seas. One ship was wrecked and another deserted, but finally, on November 28, 1520, Magellan reached the western ocean. So smooth was the sea, and so gentle were the winds that blew the three remaining ships westward, that he named the ocean "Pacific," a name that has remained to this day.

But the food ran out and the water spoiled. The men were forced to eat rats and leather, and even sawdust. Scurvy plagued the crew, killing nineteen men; but on March 6, 1521, Magellan reached the Ladrones, or Mariana Islands. The fleet then went on to the Philippines. There, Magellan aided a treacherous chief on the island of Cebu; and in a battle with natives on the island of Mactan, he was killed. Thus, Magellan never lived to see the completion of his voyage; but he became the first man to travel around the world, for in his trips to the Indies when a youth he had sailed farther east than the Philippines.

After Magellan's death, the chief killed the two men selected to succeed their leader; and, after burning one of the three boats, the remaining members went on, stopping at Borneo and the Moluccas. But here the *Trinidad,* the flagship, began to leak, and was left behind with her crew. The *Vittoria,* the lone remaining vessel, and the first ship to circumnavigate the globe, continued the voyage under Juan Sebastian del Cano, dropping anchor in the Bay of Saint Lucar, Spain, on September 6, 1522.

MAGELLAN, STRAIT OF. One of the important factors in world exploration and travel is the treacherous channel of the Strait of Magellan. It is at the southern tip of South America and separates the mainland from the Tierra del Fuego archipelago. Linking the Atlantic and Pacific oceans, it was the only route of travel between them from the time it was discovered by Magellan in 1520 until the completion of the Panama Canal. The strait is slightly more than 350 miles long.

MAGNA CHARTA, *mag′na kahr′tah,* **or GREAT CHARTER.** This document, one of the earliest expressions of liberty and democracy in Western Europe, is the foundation of the British common law. Under the influence of powerful barons, King John was forced to sign the Magna Charta in June, 1215 (see JOHN). By its provisions



A DESPOTIC KING IS CURBED BY A HISTORIC DOCUMENT OF FREEDOM

King John was forced to sign the Magna Charta. This was a great step toward our present civil liberties.

certain rights were guaranteed to the barons; no freeman was to be imprisoned or punished except by a lawful trial by his peers or under the laws of the land; and no taxes were to be imposed without the approval of the common council of the kingdom.

The greater part of the charter is devoted to restricting the king as a feudal superior. It was finally entered into the statute books during the reign of Edward I. There are four original copies of the document—two in the British Museum, and one each in the cathedrals of Lincoln and Salisbury.

MAGNESIA, *mag ne′zhe ah.* Many people troubled with dyspepsia turn to magnesia as a remedy. Magnesia is a white, tasteless substance, alkaline in nature, and is absorbent. It is a mild laxative. It is made by combining magnesium and oxygen. Able to withstand high temperatures, it is often used as a heat insulator for steam pipes and hot vessels.

MAGNESIUM, *mag ne′ shi um.* Although it does not occur free, magnesium, a chemical element, is very abundant in nature in compounds. Its symbol is *Mg.*

Magnesium is a silvery-white metal, only 1.75 times as heavy as water. It melts at about red heat and boils at a temperature somewhat higher. It does not rust readily in air. It can be drawn into wire or pressed into ribbon. When heated in air it is easily ignited and burns with a brilliant white light, forming the oxide and also the nitride. This rich light is a source of artificial light in photography and in fireworks. Magnesium is, therefore, found in flashlight powders.

Compounds of magnesium are abundantly found in the earth's crust, in rocks, in seawater, and in mineral water. It is also widely distributed in both animal and vegetable matter, being an essential element in the formation of both. In plants it is a constituent of chlorophyll, the green coloring matter that causes the union of carbon dioxide and water to form sugar (see CHLOROPHYLL).

The carbonate of magnesium occurs as the mineral magnesite, and is also mixed with calcium carbonate in dolomite and magnesian limestone (see DOLOMITE). Other well-known magnesium minerals are its silicates, such as soapstone, asbestos, and talc. Its hydroxide is used in medicine as a mild alkali to neutralize acidity in the stomach, and as a laxative. Its sulphate is Epsom salt. Magnesium salts are used in chemical analysis for determining the amount of phosphate in fertilizers or in soil.

Extensive and growing use is being made of light and strong alloys of magnesium and aluminum, such as *magnalium* and *duralumin,* the latter of which also contains some copper. Magnesium is considered one of the nation's "strategic minerals."

MAG'NET. See MAGNETISM.

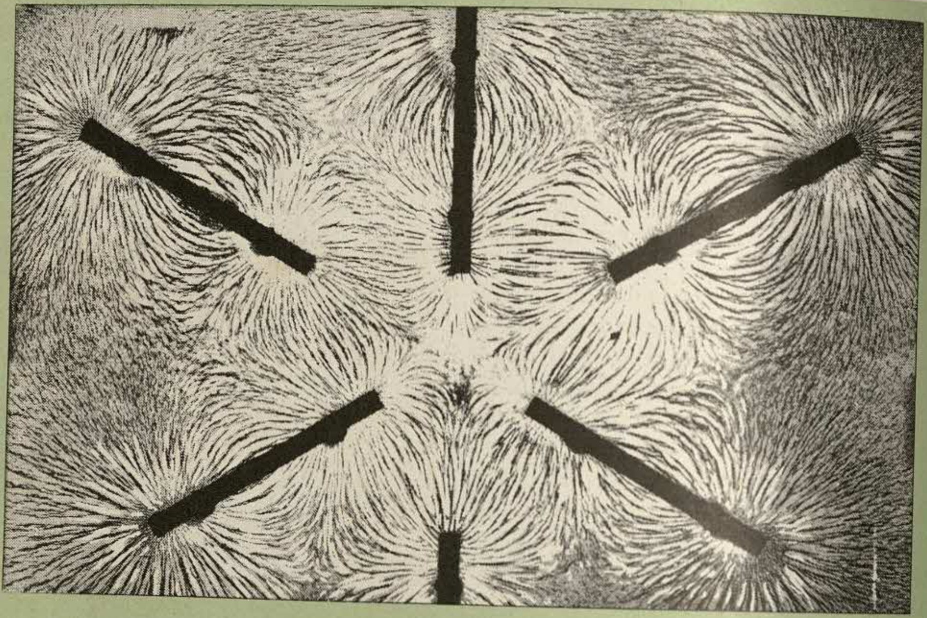
MAGNET'IC EQUATOR, *e kwa'tor.* Encircling the earth near the geographic equator is an imaginary line known as the magnetic equator. At no point is it more than 16° north or south of the geographic equator. At all points on the magnetic equator, the dipping needle (a compass operating vertically) has no dip, and the needle stands at zero.

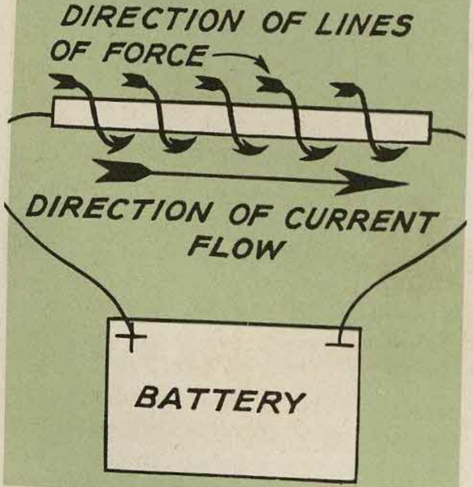
INVISIBLE MIGHT
The industrial electromagnet handles pieces of metal at the flip of a switch.

MAGNETIC NEEDLE. See MAGNETISM; COMPASS.

MAGNETISM, *mag'net iz'm.* Nature displays in magnetism a force which has been extensively studied but is not as yet exactly understood. In ancient times it was known that certain pieces of iron ore would attract small bits of iron. They were called *magnetic stones,* because they came from the district of Magnesia, in Asia Minor. Later it was discovered that, if allowed to swing freely, a magnetic stone would point north and south. It was also found that these properties could be imparted to a piece of hard steel.

In modern times it has been proved that almost any substance is affected by contact with a magnetic stone or any magnetized object. Steel becomes permanently magnetic, soft iron temporarily magnetic. Nickel and cobalt and liquid oxygen and many other substances are attracted; tin





Left, courtesy General Motors Corp.

CONTROLLING MAGNETIC ENERGY

Essential to many machines are electromagnets, those pieces of iron, steel, nickel, or cobalt which can be magnetized by a source of electrical energy. Magnetic fields are the *lines of force* traveling inside and around the magnet. These align iron filings in patterns (above). Left, a diagrammatic electromagnet.

and copper and some others seem to be repelled. It has also been shown that the earth itself is a huge magnet, the sun a still greater one; and some scientists think that every rapidly whirling body develops magnetism.

Magnetism and Electricity. A magnet will attract iron through intervening air, although its attraction decreases proportionally as the square of the distance increases; if the distance is doubled, the attraction is one fourth as great. The attraction through space is found to follow certain definite curved lines, called *lines of magnetic induction,* or *lines of force.* The region within which they occur is a *magnetic field.*

The study of magnetic fields has resulted in making electricity useful to man, for it has been found that disturbance in a magnetic field can set up a current of electricity. The dynamo, with which we manufacture electricity, and the magneto are results of this discovery. It has also been found that an electric current is surrounded by a magnetic field. Knowledge of this has given us the electric motor, by which electromagnetic force is converted into mechanical force; the electromagnet, the most powerful magnet known; and wireless communication.

The Theory of Magnetism. If a piece of iron pipe is held vertically, but with the lower end pointing slightly north, and is struck sharply on the upper end with a hammer, it will become a magnet. Its upper end will attract and its lower end will repel the north-pointing needle of a compass.

Magnetism seems to be a property of molecules, the very small particles of which all substances are believed to be composed. In their normal state the molecules of a piece of iron probably arrange themselves in such a way that the magnetism of each is balanced by that of several others. When the iron is magnetized, however, the molecules all pull in the same direction. The piece of iron pipe held as described, is in one of the earth's lines of magnetic induction. When it is tapped, the molecules are jarred and are presumed to rearrange themselves under the influence of the earth's magnetism.

Some scientists believe that this molecular action is produced by electrons moving in orbits within the atom.

Consult the following articles for additional information:

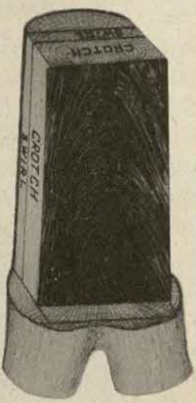
Compass
Electromagnet
Electromagnetism
Magnetic Equator
Magneto-Electric Machine

MAGNE'TO-ELECTRIC MACHINE, or MAGNETO. The difference between the dynamo and the magneto-electric machine, or magneto, is that in the latter there is a permanent magnet instead of one which is magnetic only when a current of electricity passes around it (see DYNAMO). The rotating part of the magneto (the armature) has many turns of wire wound about a soft iron core. As the armature rotates between the poles of the permanent magnet, the wire passes through a magnetic field, and an electromotive force is induced in the coil. As this force is in alternating directions, alternating currents are set up in the armature.

Small hand-operated magnetos are used to generate current for temporary use, as for small portable telephones or radio sets; they were used on early automobiles to produce the cylinder spark. Modern automobiles employ a storage battery and motor-driven generator to supply a greatly increased number of electrical outlets. The magneto has been used for ignition in tractors, motorboats, and airplanes. See ELECTROMAGNET; MAGNETISM.

PRIDE OF THE OLD SOUTH
Full-blooming magnolias brighten any garden.

MAGNO'LIA. Large, beautiful flowers and attractive foliage are typical of the numerous species of trees and shrubs of the genus *Magnolia*. One of the finest species is the *large-leaved umbrella tree*, which is popular as an ornamental in America and Europe. The flowers of this magnolia are beautiful, creamy-white structures, resembling water lilies, and are from eight to twelve inches wide. The inside of the flowers is purple or rose-colored. The fruits are bright rose-colored spheres, and



Mahogany Association, Inc.

JUNGLE GIANTS MAKE BEAUTIFUL FURNITURE

A huge mahogany tree dwarfs a grown man. This tree was six feet eight inches through, at the cut fifteen feet above the ground. Its characteristic root buttresses extended thirty feet from the tree.

Hauling a mahogany log out of the jungle takes many strong men. The trees grow singly, sometimes many miles apart.

Of the many beautiful figures in mahogany, one of the most famous is the crotch, which comes from the trunk of the tree just below where it forks into two almost equal branches. The parts nearest the bark have the swirl figure; the center of the block displays the true crotch figure.

the leaves, clustered on the flowering branches, may be one to three feet long.

The *sweet bay* is another member of the genus. It grows naturally over a wider territory, being found southeast of a line from Massachusetts to Texas. As its flowers and leaves are smaller than those just described, it lacks the decorative value of the umbrella tree. Its worth is more substantial in that its wood is of some use in the manufacture of woodenware.

MAG′PIE. This crafty bird is related to the crow and the blue jay. It is about twenty inches in length, half or more of which may be the tail, its most striking feature. The general color is metallic black with white on the wings and under parts.

Magpies are often seen in pairs or small flocks. They are sly, mischievous, and thieving in disposition, eating all kinds of food, but delighting to rob the nests of smaller birds. They are sometimes kept as pets and may be taught to say a few words, but they usually cause more trouble than pleasure to their owners.

The magpie builds a strange nest. It collects a mass of sticks in a bush or tree, often enough to fill a bushel basket, cements the sticks with mud, and lines them with grasses and roots.

MAGYARS, *mod′yahrs.* These people, descended from Asiatic tribes which invaded Europe during the tenth century, are the dominant race in Hungary. Prior to World War I, they formed a constitutional kingdom in the Austro-Hungarian Monarchy and took part in the war on the side of the Central Powers. Today they number more than 11,000,000. Their country became independent after the war. See Hungary.

MAHOG′ANY. This fine, hard wood came into use for furniture making in the 1700's and continues to be a favorite because it is beautiful and strong and useful for many purposes. The wood is naturally a rich, reddish brown, but is given a variety of finishes, from pale beige to dark brown. Fine mahogany furniture is made of solid mahogany surfaced with highly figured veneers, which are thin slices of mahogany logs.

Mahogany trees usually grow ninety to one hundred and twenty-five feet tall and three to four feet in diameter, although they may reach one hundred and forty feet and have a diameter of six to seven feet. The mahogany tree has bark like the elm, leaves like the ash, and pear-shaped fruit that encloses wingless seeds. Several other timbers, such as *Philippine mahogany* and *white mahogany,* are improperly called mahogany. The first mahogany used came from the West Indies, but most mahogany now comes from tropical America and the west coast of Africa.

MAHOM'ET. See MOHAMMED.

MAID OF ORLEANS. See JOAN OF ARC.

"PINE TREE" STATE CAPITOL
Maine's laws are made at Augusta.

MAINE. In the extreme northeastern corner of the United States, like a wedge driven between the Canadian provinces of Quebec and New Brunswick, is the state of Maine, land of verdant mountains and deep valleys, whose extensive evergreen forests have given it the name of "the Pine Tree State." Maine is often called "the Playground of America," because every year thousands of tourists are attracted to its rugged seashore and beautiful inland lakes. Every fall many hunters come in quest of moose, deer, and other game, and during the summer there is excellent fishing.

Maine is the largest state in New England, with an area of 33,215, including inland waters. At its widest part, the Atlantic coast, it extends 210 miles. It is 320 miles long. The population is about 974,000, of which almost half live in rural areas. The largest city is Portland, with about 75,000 people. Augusta, the capital, has a population of about 21,000.

The Land and Its Features. For the most part, the surface of the state is gently rolling, rising to mountain peaks of the Appalachian system in several places. Almost in the middle of the state is the highest peak, Mount Katahdin, with an altitude of 5,268 feet. This mountain is the center of a state park. Nearly in a line with it are several other peaks, including Mount Abraham, Mount Bigelow, Saddleback, and Mount Blue. To the north of this line is a watershed, which divides the state into north and south slopes. South of the mountains the land is rough and hilly and slopes down to the deeply indented coast line. Off the coast are several rugged islands, the largest of which is Mount Desert Island, a popular summer resort and the site of Acadia National Park.

The rivers are divided into two systems, the interior and the seaboard. The latter includes the Penobscot, Androscoggin, Kennebec, and Saint Croix, all of which are swiftly running streams. The interior rivers all flow into the Saint John. Maine has more than 1,600 lakes, the largest of which is Moosehead Lake, lying in the center of the state.

Climate. The average annual temperature of the state is about 41° F. The winters are long and cold, with heavy snowfall. The rainfall is so evenly distributed that severe droughts or damaging rainstorms are rare. The large wooded areas and hills in the state are a protection from windstorms.

Maine Development Commission

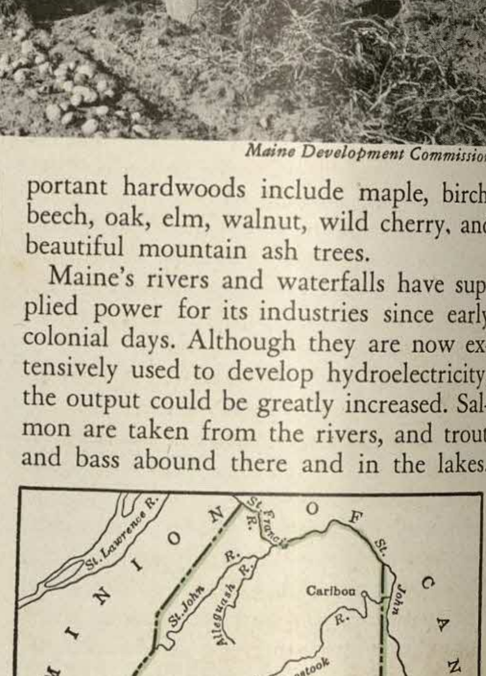
MACHINES WHIP POTATO CHORE

Much of the backbreaking labor has been taken out of the harvesting of potatoes, a major crop in Maine. Near Caribou, potatoes are uncovered by tractor-drawn digger, loaded into barrels, and hoisted by derrick aboard a waiting truck.

Natural Resources. Many fine buildings in the United States have been made of Maine's excellent granite. The state also quarries large quantities of limestone for use as building stones or for making cement and lime. In addition, it is an important supplier of slate, feldspar, and beryl, a semiprecious stone; has vast deposits of manganese ores; and is noted for its mineral water. That from Poland Springs, one of America's leading spas, is especially well known, being shipped far and wide.

Many of the lordly white pines that originally dominated Maine's huge virgin forests have been cut down. Yet nearly half of the state is still tree-clad, and lumbering is a leading industry, as it has been ever since the coming of the white man. From Maine's red spruce trees come enormous supplies of wood for its great pulp and paper mills. The state also produces large quantities of timber for construction purposes, and many of the East's fir Christmas trees. Among the other softwoods, still Maine's most valuable trees, are balsams, hemlocks, and tamaracks. Important hardwoods include maple, birch, beech, oak, elm, walnut, wild cherry, and beautiful mountain ash trees.

Maine's rivers and waterfalls have supplied power for its industries since early colonial days. Although they are now extensively used to develop hydroelectricity, the output could be greatly increased. Salmon are taken from the rivers, and trout and bass abound there and in the lakes.



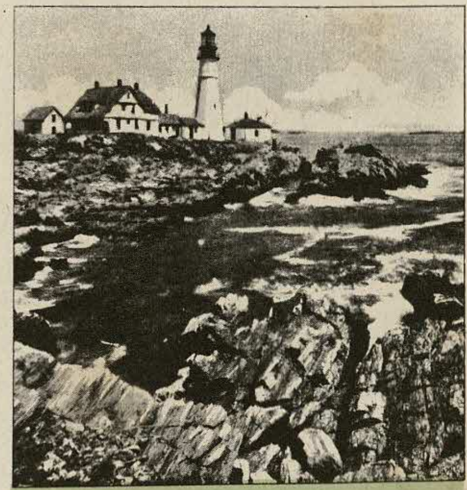
Beautiful Maine borders New Brunswick, Quebec.

Like lumbering, salt-water fishing has been a leading industry since earliest colonial times. Halibut, cod, haddock, mackerel, tuna, and herring for sardines are only a few of the fine food fishes harvested from the sea by Maine's fishermen, many of whom sail as far as the Grand Banks to make their catches. Penobscot Bay is nationally famous for its lobsters, scallops, clams, and crabs. Rockland, on the bay, and Portland are the chief fishing ports, but fishing villages dot the coast.

Farming. Maine leads the nation in the production of potatoes, grown chiefly in Aroostook County in the extreme north. It also grows more blueberries than any other state and is a leading producer of apples, turkeys, chickens, and eggs. Other outstanding farm products include sweet corn, peas, beans, and other vegetables. Dairying, also important, supplies milk, cream, butter, cheese, and ice cream.

Industry and Transportation. Shipbuilding has been a leading industry since 1608, when the first vessel ever made by an Englishman in the Americas was built from Maine pine and launched at the mouth of the Kennebec River. Later, during the schooner- and clipper-ship era, Maine built more ships than any other state. The coming of iron and steel vessels caused the building of ocean-going ships to decline, but the industry was revived during World Wars I and II. Moreover, in normal times, Maine has long been famous for building fishing boats, canoes, and pleasure craft. It is also one of the nation's leading pulp and paper producers. Its many other wood products include furniture and veneers. Also among its outstanding industries are the manufacture of shoes, textiles, sheets, carpets, rugs, and oilcloth, and the making of starch and alcohol from potatoes. Fish, fruits, and vegetables are frozen and canned, and leather is tanned.

The state is connected with the rest of the United States and with Canada by sea, air, rail, and highways. Portland, its largest city and most important port, is the leading transportation center.



"STERN AND ROCK-BOUND COAST"
Maine's is a rugged beauty in keeping with its stormy North Atlantic location.

Government and Education. The governor is elected for a four-year term. He is assisted by an executive council of seven members chosen by the legislature. The council must approve disbursements from the treasury and many appointments. With the exception of the governor, the main executive officials are also chosen by the legislature. Members of both houses of the legislature are elected for two years. Elections of the governor and legislators are held in November at the same time as the presidential election.

The state maintains the University of Maine at Orono, teachers' colleges, and normal schools. Among its outstanding private institutions of higher learning are Bowdoin (established in 1794), Colby (1813), and Bates (1854) colleges.

History. The Vikings are believed to have landed on the Maine coast about 1000 A. D. (see ERICSON, LEIF). In any case, several explorers, including the Cabots, Verrazano, John Hawkins, Gilbert, Gosnold, John Smith, Champlain, and Cartier, are connected with its early history. A short-lived English settlement, headed by George Popham, was made at the mouth of the Kennebec in 1607. A grant of land between the Merrimack and Kennebec was made

PROUD END OF A GOOD DAY'S HUNTING IN MAINE

Vast forested sections of Maine are still uninhabited; make fine grounds for huntsmen.

to John Mason and Ferdinando Gorges in 1622. The grant was later divided between the two. One of the first permanent settlements was at York. Massachusetts had for a long time claimed the territory of Maine, and in 1677 purchased the Gorges claims. By a new charter in 1691, Maine and Massachusetts were united. Maine did not become a separate state until 1820, when it was admitted to the Union. In 1831 Augusta became the capital.

Much trouble arose over the distribution of public lands within the state. The Aroostook War of 1839 grew out of the boundary dispute between Maine and New Brunswick; it was settled by the Webster-Ashburton Treaty of 1842. In 1851 Maine passed the first prohibition law in the United States. See AUGUSTA.

MAIZE. In Europe, field corn or Indian corn is commonly known as *maize*. See CORN.

MAJOL'ICA. In the thirteenth century or earlier, Spanish pottery makers rose to new heights in creating majolica, a beautifully decorated, enameled ware. Later, the art shifted to Italy, which has produced the world's finest specimens. Single pieces of this splendid ware, of the fifteenth and sixteenth centuries, sell at prices ranging from $1,000 to $10,000. The world's finest collection has been given by J. P. Morgan to the Metropolitan Museum of Art, New York, and the Wadsworth Athenaeum, Hartford.

MAJOR. See MUSIC; SCALE.

MAJOR. See RANK.

MAJORCA, *ma jawr' ka.* Largest of the Balearic group in the Mediterranean, Majorca lies about 200 miles off the east coast of Spain, to which it belongs. The island is but fifty-eight miles long; its total area is 1,352 square miles. Irregular and deeply indented, Majorca's north and west coasts are steep and rocky; elsewhere on the coast, the land is a low, fertile shelf. The principal exports are fish, silk, cereals, hemp, fruit, and flax. Great herds of livestock are raised. Majorca is well supplied with rail transportation. The capital is Palma. The population is about 300,000.

MAJOR GENERAL. See RANK.

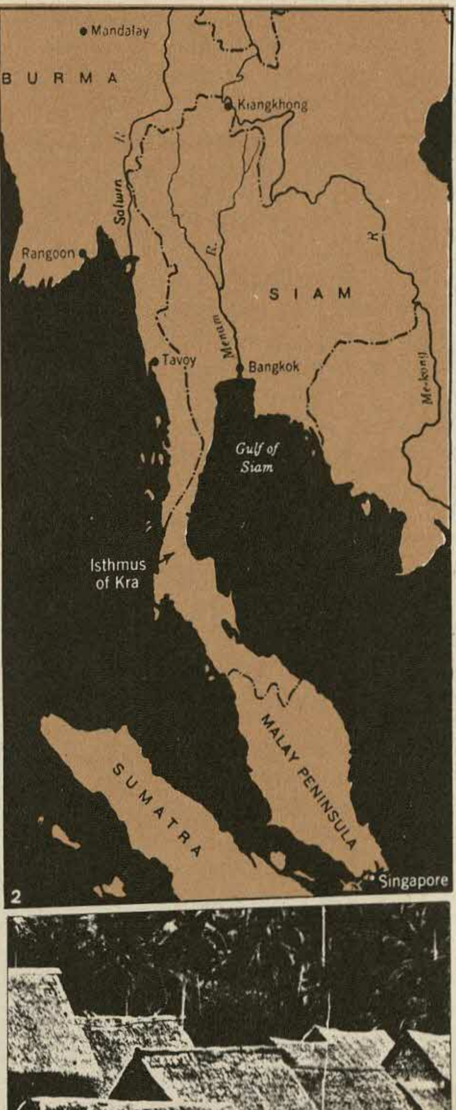
MALAGASY REPUBLIC. See MADAGASCAR.

MALAY'A, FEDERATION OF, includes nine states on the Malay Peninsula and the settlements of Penang and Malacca. It became independent August 31, 1957, after being controlled since 1511 by the Portuguese, Dutch, or English. Chief products are rice, rubber, tin, coal, palm products, tea, fish, and livestock. The population is about 6,500,000. Kuala Lumpur is the capital.

MA'LAY ARCHIPEL'AGO. The largest group of islands in the world is called the Malay Archipelago. The group is southwest of Asia, between the Pacific Ocean and the Indian Ocean. Some of the world's largest islands are in the group, which includes the Philippines, the Celebese, New Guinea, Borneo, Sumatra, Java, and many smaller islands. Most of the islands are mountainous and there are several volcanoes. Rich vegetation and mineral deposits attracted the great commercial nations. The Portuguese came in the 1500's. Later the Spanish, Dutch, and English were in control. The United States had possession or supervision of the Philippines from 1898 to 1946. Japan had strong influence after World War II. Most of the islands are now independent. See BORNEO; CELEBES; INDONESIA; NEW GUINEA; PHILIPPINES.

MALAY RACE. See RACES OF MEN.

MAL'DIVE ISLANDS. Southwest of India and lying about 400 miles west of Ceylon, in the Indian Ocean, is a chain of



THE COLORFUL CROSSROADS OF THE ORIENT

The Malay Peninsula is a land of many peoples and countless strange sights. It stretches ribbon like into the Indian Ocean from Burma. (1) Street scene, Singapore, the largest Malay city. (2) Malaya and its vicinity. (3) A native fishing village near Penang.

coral atolls called the Maldive Islands. The palm-covered islets produce coconuts, millet, fruits, and nuts. Fishing, trading, and coir making are the chief occupations of their over 93,000 peace-loving, Moslem natives. In 1953 the former British protectorate became a republic and a British Commonwealth member, but in February, 1954, the sultanate was restored.

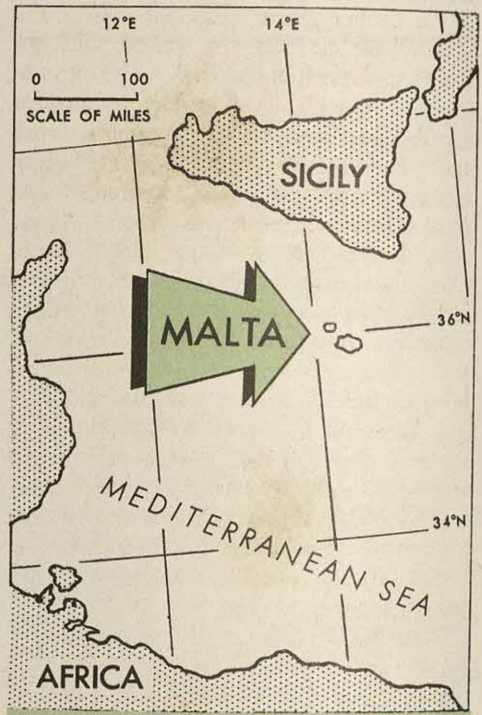
MALLEABIL′ITY. Substances, mostly metals, which can be hammered or rolled out into thin sheets are said to possess the property of malleability. Gold is the most malleable of all substances. It may be rolled into sheets so thin that 300,000 pieces placed on top of one another would make a pile only one inch thick, and a film of it was once made that was less than one-millionth of an inch thick. Such gold leaves are transparent, and the light that passes through them is green in color (see GOLD). Among other malleable metals are silver, copper, platinum, iron, aluminum, tin, zinc, and lead.

MAL′LOW. Hollyhocks, cotton plants, hibiscus, marsh mallow, common mallow, okra, and many other plants belong to the great mallow family, all species of which secrete a gluelike substance. The *common* mallow has purplish flowers, which become blue when dry and give up their color in alcohol or water.

The *dwarf* mallow, a common American weed, has handsome heart-shaped leaves with scalloped edges. Its flowers are white or purplish, its fruit flat and circular. The *musk* mallow, another species, has deeply cut leaves and gives off a musky odor.

MALT. The makers of beer, ale, porter, and whisky all depend upon malt as the basis of their products. Malt is made by steeping grain, usually barley, in water and allowing it to sprout. This process converts the starch of the grain into sugar, and the malt is then dried before entering into the brewing or distilling process.

Malt in solution appears as a thick, brown syrup. In dried form, it is often mixed with dried milk in making malted milk. Malt also finds use in the making of foods for babies and invalids and as a food for growing yeast plants. One hundred parts of barley yield ninety-two parts of dried malt; the sprouted grain is often fed to livestock.



MEDITERRANEAN FORTRESS
Although small in size, Malta occupies a position of great strategic importance.

MALTA, *mawl′ta.* Few islands are as strategically important to the commerce of the world as tiny Malta, lying in the path of the great east-west steamer routes and serving as the crossroads of the Mediterranean Sea. Whoever holds the island virtually controls the traffic of the Mediterranean. In 1814 Malta was annexed to Great Britain and became one of the world's greatest naval bases and ports of call. The headquarters and the repair and refitment base for Britain's Mediterranean Fleet, it was heavily bombed by Axis aircraft during World War II. But its people displayed unexcelled loyalty and courage and Malta continued to function.

About sixty miles south of Sicily, Malta covers ninety-five square miles. Dock work and farming are the chief occupations, but fishing and caring for the island's many winter tourists also are important. Its chief crops include wheat, barley, vegetables, cotton, fodder, and fruits. Goats, sheep, and other livestock also are raised, but the densely populated island must import much of its food. Its manufactures include cotton cloth, lace, filigree jewelry, wine, and cigarettes. The people speak Maltese, but English, the official language, and Italian also are spoken.

In its early history, Malta changed hands many times. From 1530 to 1798, it was ruled by the Knights of Malta (St. John), then was conquered by Napoleon, whose forces Britain ousted in 1800. With neighboring Gozo, Comino, and two uninhabited islets, Malta forms a British colony, whose capital and chief port is Valletta. An elected assembly controls the colony's domestic affairs, but its foreign and defense affairs are administered by Britain. The population is over 312,000. Most of the people live on Malta.

MAM'ELUKES. In the thirteenth century, the Turkish slaves, or Mamelukes, whom the Egyptians had been importing for many years, became extremely powerful. By 1250 they were able to establish a dynasty of their own, which lasted until 1517, when it was overthrown by Selim I, sultan of Turkey. They fought against Napoleon when he invaded Egypt in 1798 and were defeated. In 1811 Mehemet Ali practically exterminated them in a general massacre.

MAM'MALS. Man is the most important member of the class of mammals, and mammals are the most important group of the animal kingdom. Highest of the vertebrates (backboned animals), mammals are easily distinguished, for they form the only group in which the females suckle their young on mother's milk until their offspring can feed upon other foods. In a few of the lowest types of mammals, including kangaroos and opossums, the young may be born partially developed and must be carried and fed by the mother. Such animals are classified with the marsupials.

Common Characteristics. Most of the mammals are four-footed animals, varying in size from the mouse to the elephant. Practically all our important domestic animals, including horses, cows, hogs, sheep, dogs, and cats, are mammals. They breathe the air directly through nostrils and are covered by skin, which is usually provided with more or less hair. The skeleton of nearly all mammals corresponds closely to that of a man. The skull rests upon the vertebral column, or backbone; the skull is usually a single structure made up of bones closely joined together. To it is attached a movable lower jaw.

Mammals have warm blood, this fluid being circulated to all parts of the body by a four-chambered heart. Nearly all mammals are equipped with teeth for chewing their food and defending themselves against attack. In some species, such as the whale, no hind limbs appear; in others, as the kangaroo, the forelegs may be present but are poorly developed.

Peculiarities of Mammals. The whale, sometimes mistaken for a fish, is a mammal. Even though it lives in the water, it breathes air directly, for it possesses lungs. Other mammals, as the duckbill of Australia, lay eggs from which their young are hatched, just as are reptiles and birds. Some mammals, as the opossum and raccoon, are expert climbers, living chiefly in trees. Others, such as the bat, are able to fly and catch their food on the wing. And still others—the polar bear, beaver, muskrat, seal, and walrus—live in the water to a great extent and are expert swimmers.

Mammals are well adapted for life under varying conditions, ranging over the earth from the equator to the frigid regions. Some bear weapons of defense, such as teeth, tusks, or hoofs, while others depend upon their fleetness to escape danger. Many forms of mammals feed entirely upon vegetation; others prey upon smaller animals. Some, such as the rhinoceros, live comparatively solitary lives, while others, like the elephant, prefer to live in herds.

Consult the following titles for additional information:

- Animal
- Carnivora
- Cetacea
- Man
- Marsupials
- Primates
- Rodents
- Ungulates
- Vertebrates
- Zoölogy

MAM'MOTH. Long before the great glaciers moved across Asia, Europe, and North America, the mammoth, an extinct species of elephant, roamed over parts of these continents. Yet, in spite of the thousands of years that have intervened, the carcass of one of these beasts was found in the early part of the nineteenth century, perfectly preserved in the ice along the Lena River. This specimen is on display in the Museum of Leningrad; another is to be seen in the Chicago Academy of Sciences.

Many bones and tusks of mammoths have been found in the areas which they once inhabited. The skin of the beasts was a reddish, furry wool, interspersed with black hairs. Their long, strong tusks curved back toward the head.

MAM'MOTH CAVE. Far below the hills of Kentucky is a wonderland of awe-inspiring sights, Mammoth Cave. Located eighty miles southwest of Louisville, the cave is one of many found in an area of some 8,000 square miles; and it is one of the largest accessible caverns in the world, having a diameter of about ten miles. The main cave is three miles long; the largest room, called Chief City because it was once the meeting place of the Indians, is a great oval over 500 feet long, with a ceiling 125 feet high.

One of the highlights of the cave is Star Chamber, a massive room with a black ceiling speckled with snow-white crystals of gypsum. These crystals, when seen by reflected light, glisten like stars. Echo River, an underground stream three-fourths of a mile long, is so-named because of the remarkable echoes in the chamber through which it flows.

Already five levels of Mammoth Cave have been explored; leading to the lowest are a number of passageways. A peculiarity of the fish, insects, and animals which are found in the caverns is that they are blind.

Mammoth Cave is supposed to have been discovered in 1809 by a hunter. Saltpeter was found in the caverns and was used in the manufacture of gunpowder in the War of 1812. Mammoth Cave National Park was established in 1936 by Congress. It includes an area of fifty-four square miles.

MAN. As far back as we can go in history, man has sought the answer to the question, "What is man and where did he come from?" It is the belief of some scientists that man is no different from other animals except that he has a more highly developed nervous system. Others claim that man is a combination of the spiritual and the physical. In either case, there are certain general observations which can be made.

Man has a higher intelligence than any other animal, and a rational faculty not possessed by any other. He has the capacity for standing erect and for using his hands to grasp and hold objects. His cranial capacity is greater than that of other animals, and the convolutions of his brain are more numerous. He has the potential abilities for writing, talking, and drawing designs. Most animals live and act in the manner of their ancestors, seeming to inherit their mode of life and to act by instinct. On the other hand, each man lives his own life, subject to his immediate environment, experiences, and training. It has even been intimated that there are no instincts inherent in human beings, although there are hereditary characteristics.

Where man came from and how he came to live in all parts of the earth cannot be definitely answered. According to the Bible and other religious writings, he was created by God in his present state and scattered over the face of the globe thereafter. Darwin believed that man and other primates (apes) developed from one common ancestor, now extinct. Although in many ways the gorilla, orang-utan, and chimpanzee resemble man, he differs from them physically in the shape of his facial bones,

ELEPHANT'S FEROCIOUS ANCESTOR

Enormous mammoths, far larger than the elephant of today, once roamed over several regions in the prehistoric world. They were a match for any beast. Left, a mammoth's skeleton.

SOUTH AMERICA'S SEA COW
Called "cattle of the sea pastures," manatees have feeding habits like those of cows.

length of arms, and his erect posture. His teeth are uniform and close together, and hair does not cover all parts of his body.

For additional information, consult the following articles:

Age of Man
Evolution
Foot
Geology
Hand
Mammals

MANATEE′, or SEA COW. The Manatee River in the west-central part of Florida is named for this water mammal because sea cows were formerly found feeding on the abundant water plants of the river.

Manatees are found along the northeastern coast of Africa, in the Pacific and Indian oceans, and near river mouths in Guiana and Northern Brazil, but are very scarce in North American waters. They live in shallow waters of bays, where they feed upon vegetable material. These creatures are about nine feet long, on the average, although large specimens may reach fifteen feet. They are cylindrical in shape and have flattened tails. Their two flippers (limbs adapted for swimming) are in front and are about one foot long. The eyes are small. The wrinkles on the faces of sea cows give them an old, serious look. Manatees are harmless, interesting creatures.

MAN′CHESTER, ENGLAND. Center of the cotton-manufacturing industry of England, Manchester ranks fourth in size in that country and is one of the most important factory towns in the world. Manchester lies about 170 miles northwest of London and thirty-two miles from Liverpool. Ocean liners can enter the city by means of the Manchester Ship Canal, which joins the Mersey River at Eastham. This great waterway, built at a cost of $75,000,000, is lined with wharves for six miles.

Manchester's fine structures include the municipal building, of Gothic style, the Assize Courts, the Free Trade Hall, the Royal Exchange, Victoria University's new buildings, Chetham Hospital, and a strikingly beautiful cathedral. In front of the town hall stands Prince Albert Memorial, an impressive monument. The chief educational institution of Manchester is Victoria University.

The center of the city is a mass of busy warehouses and offices, while the mills and other factories are located on the outskirts. Although cotton is the outstanding manufacture, the weaving of silks and woolens and the manufacture of machinery and metals are also important.

The city was destroyed by the Danes in the tenth century. About two centuries later, wool spinning had its beginning. Suffering a temporary slump during England's civil wars, Manchester again prospered with the introduction of modern spinning and weaving machinery in the eighteenth century. The city was hurt by the cotton famine caused by the American War between the States and was bombed in World War II. Population, about 705,000.

MANCHURIA, *man choor' ih uh.* Making up the northeast corner of China, Manchuria takes its name from the Manchus who conquered China over three centuries ago and ruled it until 1912. Between 1931 and 1945, however, its Japanese occupiers called it Manchukuo, meaning *Land of the Manchus,* and the Chinese themselves now refer to it as Tung-pei, or the *Northeast.*

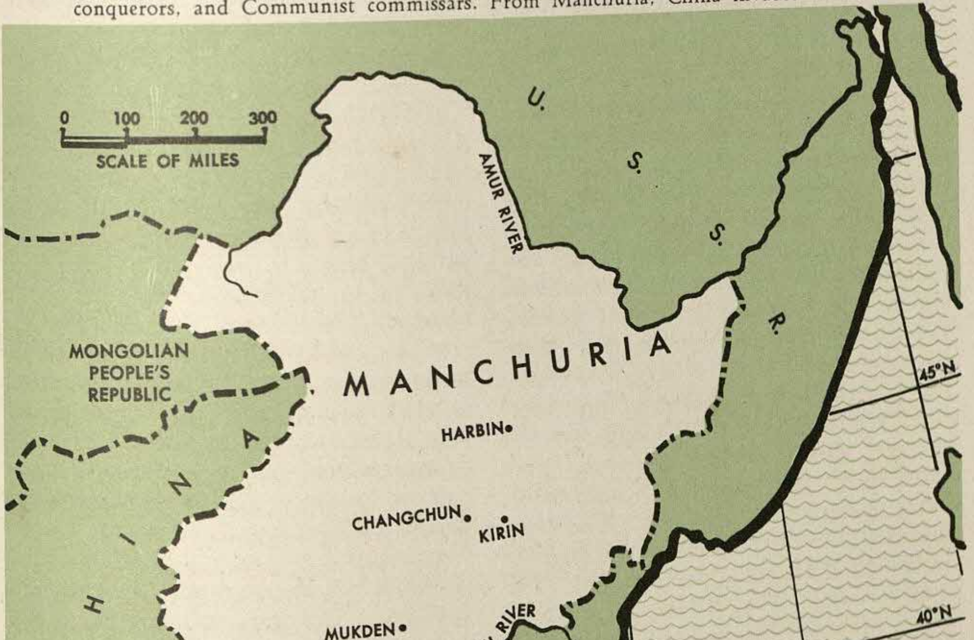
Besides being an exceptionally fine farming and grazing region, Manchuria is rich in minerals and forests and is the most industrialized part of all China. Moreover, it is truly a "land of promise," for it could support many more people and its development is barely begun. Mukden is its largest city.

Geography and Climate. Almost one sixth the size of the Continental United States, Manchuria is a fertile plain nearly encircled by hills and mountains. From southeast to southwest, its neighbors are Korea, Russia's Siberia, Mongolia, and China; on the south it is washed by arms of the Yellow Sea. The Amur River and its tributaries form most of its border with Siberia; the Yalu, part of its boundary with Korea. Before joining the Amur, the Sungari and its chief tributary, the Nonni, drain most of northern Manchuria. The Yalu, the Liao, and their tributaries drain the south. The Japanese-built hydroelectric-power dams on the Yalu and Sungari have aided Manchuria's industrial development.

The climate is continental in type, with great extremes of temperature. In the south

MANCHURIA — TRADITIONAL TARGET FOR CONQUEST

Rich in resources, the vast plain has been ruled at various times by emperors, warlords, foreign conquerors, and Communist commissars. From Manchuria, China invaded Korea.



the temperature ranges from 100°F. in summer to 30° below zero in winter. The rainfall is very unevenly distributed, with most of it falling in the summer months.

Industry and Agriculture. Manchuria is rich in natural resources. It is both a heavy-industry region and one of the richest farming areas of China. There are great deposits of coal, iron, lead, gold, aluminum, asbestos, magnesite, and oil shale. Soybeans, sorghum, millet, corn, wheat, and rice are a few of the crops that are raised and help feed China's large population. Besides being a center of steel industry, Manchuria manufactures bean oil and cakes, flour, cotton goods, and silk. Its mountains are heavily forested and provide valuable timber. This is an important resource in China where many forests of the past have long been exhausted.

History. After 1900, Manchuria was the object of intense rivalry among Russia, China, and Japan. The country's strategic position in Asia and her great natural wealth promised much for nations that could develop them.

Japan took control of Manchuria after war with China in 1894, but stronger nations prevented her from keeping it. The country's status remained uncertain until the Japanese invaded the territory in 1931. After that a new government was established under Japanese domination and the country was called Manchukuo. Russia sold the new government its interest in the important Chinese Eastern Railroad, which crosses the country. Russia and Japan maintained peaceful relations in Manchukuo until 1945, although there were some clashes between their forces in the 1930's.

China claimed sovereignty over Manchuria after the Chinese Revolution of 1912, but the Chinese were ineffective against Japan. After Japan's defeat in World War II, Manchuria was returned to China. Russia worked with the Chinese Communists to put Manchuria under Communist control and by 1949 the Nationalists had been driven out. It was from Manchuria that Chinese Communists invaded Korea in 1950. Russia, after controlling the important Chinese Eastern railroad for some years, returned it to China in 1950. Russia was allowed to keep Port Arthur. See CHINA; CHINESE-JAPANESE WARS; JAPAN; WORLD WAR II.

MAN'DAN. Meriwether Lewis and William Clark, leaders of the first expedition into the West and Northwest, spent their first winter in the camps of the friendly Mandan Indians of North Dakota. At that time, the Mandans were a powerful and large tribe, but wars with the Sioux, combined with a smallpox epidemic, reduced them to a handful. The Mandans lived in huts of log framework with domelike, earth-covered roofs, and they navigated the rivers in peculiar tublike boats called *bull boats*. They differed from other Indians in appearance, often having brown hair, gray or blue eyes, and light skins. Many explanations have been given for their appearance, including intermarriage with lost Norse explorers.

MANDATE. After World War I, the Allied powers took certain colonial areas away from defeated Germany and Turkey. The Allies did not want to annex the territories, but wanted to prepare them for self-government. They placed the territories under jurisdiction of the League of Nations. The League made these areas *mandates,* and placed them under the direction of one of the Allied powers subject to the League's supervision. After World War II, many of the mandates became independent nations. Eight of them became trusteeships under the United Nations. See LEAGUE OF NATIONS; TRUSTEESHIP; UNITED NATIONS.

MAN'DOLIN. In origin, the mandolin is allied to the violin and the guitar. It is a stringed musical instrument of rather thin tone, played by vibrating the steel strings with a pick, or plectrum, and stopping them against frets on the neck, to produce a melody.

Because the mandolin plays melodies, as the violin does (instead of chords, as the guitar), the plectrum must be kept in constant motion to give the proper length to the notes. A *tremolo* music is the result.

The mandolin is a popular instrument among young people. Alone or with the guitar, it is a satisfactory accompaniment for the voice. Mandolin clubs are numerous. On the water or in camp, especially in the evening, the mandolin is charming.

MANDRAKE BLOSSOM

MAN'DRAKE, or MAY APPLE. A wild plant of the barberry family, the mandrake is conspicuous on account of the two large, umbrella-like leaves which each plant possesses. The flower, located in the axil of the leaves, is white and pretty, but of mildly offensive odor. The lemon-shaped fruits are frequently eaten by children, a practice that sometimes causes serious illness. All parts of the plant except the fruit are very poisonous. Strange sores may result from handling the roots; and it is said that the milk of cows that have grazed on the leaves is very injurious. The plant is somewhat common along fence rows and in rich woods throughout the eastern half of the United States.

MAN'DRILL. The "clown" of the monkey family is the mandrill, a grotesque baboon of Western Africa. The males reach a height of five feet, are very strong, and have ugly dispositions. The mandrill's head is crowned with black hair, his beard is yellow, his cheeks are striped red and blue, and his nose is bright red.

MANGANESE, *man'ga nees.* Somewhat like iron in appearance, the hard, reddish-gray metal known as manganese is found in various mineral waters, in vegetables and grains, and in iron, silver, and lead ores. It will rust in moist air, reacts with acids, and liberates hydrogen. It is seldom used alone, but combines well with copper, lead, zinc, iron, tin, and aluminum, and is often added to steel to give it hardness and elasticity. Potassium permanganate is used in the construction of dry cells; other manganese compounds are used in the manufacture of pottery and flint glass. Its symbol is *Mn.*

MAN'GO. To the people of Southern Asia, the mango is an important fruit. Mango trees are evergreen and related to the pistachio nut and cashew. In Southern Florida, where it has been naturalized, the tree blooms from December to April.

The better varieties of fruit weigh about four pounds and are variable in shape. They are eaten fresh and in salads. The thick, yellowish skin has the flavor of turpentine. The flesh is orange-colored, and has a spicy aroma and a rich flavor varying from sweet to subacid. The flesh of inferior varieties is fibrous, but that of the better sorts has a smooth texture. The mango has a hard stone in the center of the pulp.

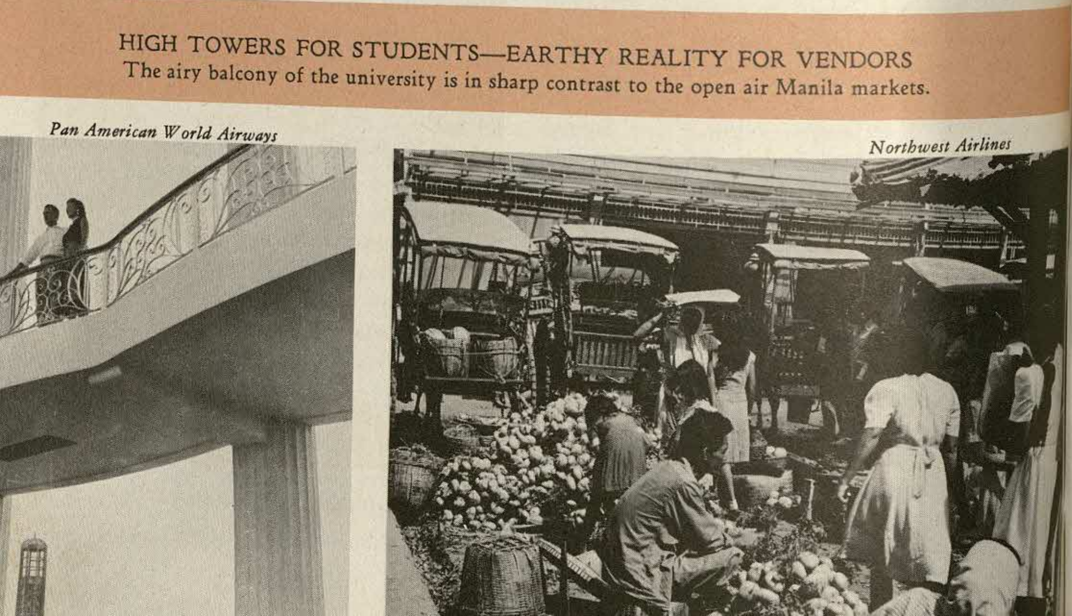
MAN'GROVE. Along low, tropical beaches the banyan-like mangrove trees form almost impassable barriers of trunks and of roots which grow down from the branches to start new growth in the mud below. The seeds of the plant sprout in the pods, sending out shoots that also find their way downward to the mud. So closely together do these trees grow that their matted roots hold the sediment washed in by the tides, and so the coast line gradually moves farther into the sea. The sweet juice from the edible fruit of certain varieties is used to make wine.

MANHATTAN ISLAND. Probably no other area of equal size anywhere in the world is as busy as tiny Manhattan Island, lying at the mouth of the Hudson River and forming one of the five boroughs of New York City. It has an area of twenty-two square miles, and crowded into it are some 2,000,000 people. Its rocky base made possible the building of the huge skyscrapers which house the myriad business offices of the city, and along the shores are many wharves and docks. The Dutch settlers purchased the island from the Indians for goods valued at $24, and today no other comparable area in the world is as valuable. Its Indian name was *Mannahatta.* See NEW YORK CITY.

MANIL'A, REPUBLIC OF THE PHILIPPINES. Facing the turquoise waters of tropical, palm-fringed Manila Bay, with mountains on its other sides, Manila is called the "Pearl of the Orient." Its harbor, formed by the bay and the mouth of the Pasig River, is one of the world's finest, handling coconut products, abacá (Manila hemp), sugar, and the other items making up the Philippines' vast overseas trade. The country's chief port and trading center, Manila is connected with the outside world by air, as well as by sea. Besides shipping, its industries include sugar processing and the making of cigars, cigarettes, rope, soap, and furniture. The Philippines' largest city Manila has over 2,000,000 people, mostly Filipinos.

The city lies on Luzon Island's west coast, over 600 miles southeast of Hong Kong and more than 6,000 miles southwest of San Francisco. Its Intramuros (Walled City), the old Spanish section on the Pasig's south bank, was practically destroyed during the American-Japanese fighting of World War II. The modern business section and other residential areas, across the river, were severely damaged, too. The Escolta is Manila's chief shopping street; bay-fringing Dewey Boulevard, its most famous drive; and Luneta, its most popular park. Its University of Santo Tomas, founded in 1611, is older than any in the United States.

Manila was founded in 1571 by Legazpe, the Spanish conqueror of the islands, and became an important commercial and missionary base. Surrendered to the United States in the Spanish-American War of 1898, the city was occupied by the Japanese from 1941 to 1945. The Philippine Republic in 1948 moved its capital from Manila to one of its suburbs, Quezon City. See DEWEY, GEORGE; PHILIPPINE ISLANDS; SPANISH-AMERICAN WAR; WORLD WAR II.



Pan American World Airways

Northwest Airlines

HIGH TOWERS FOR STUDENTS—EARTHY REALITY FOR VENDORS
The airy balcony of the university is in sharp contrast to the open air Manila markets.

PROVINCIAL CAPITOL
Winnipeg is the seat of government for this progressive province.

MANITO'BA. Lying almost midway between the Atlantic and Pacific, Manitoba is often called Canada's "Keystone Province." On the south it borders the American states of Minnesota and North Dakota; on the west Saskatchewan; on the east Ontario; and on the north the Keewatin District of the Northwest Territories. Hudson Bay forms its northeast border.

Covering 251,030 square miles, Manitoba is largely low, level country with many large lakes, including Winnipeg, Manitoba, and Winnipegosis. Most of Manitoba's more than 850,000 people live in the southern section, where Winnipeg, the capital, and most of the other chief cities of the province are located.

Climate. Manitoba's summers are short and warm, its winters long, with subzero cold. Most of the light rainfall occurs during the growing season.

Resources. Fishing, trapping, and lumbering are very important, for the province has huge forests and an abundance of food fishes and fur-bearing animals. There are also large supplies of zinc, copper, nickel, gold, silver, gypsum, iron, salt, lignite, and other treasures. Flin Flon, in the west, is the chief mining and ore-processing center and one of America's largest zinc and copper suppliers.

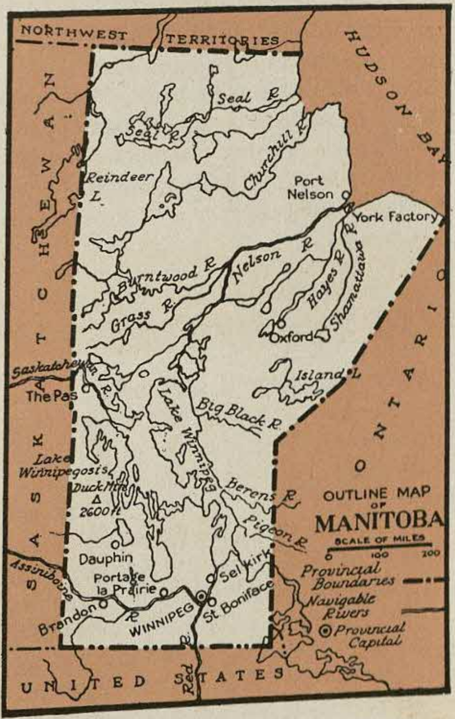
Farming and Industry. Manitoba long has been famous for its vast wheat fields, especially those of the Red River Valley. Also grown are oats, barley, flax, potatoes, and vegetables. Fur farms supplement the furs obtained through trapping. Livestock raising and dairying are important sources of income.

Manitoba also is an important industrial province. Railroad equipment and farm machinery are manufactured. Flour and feed milling and meat packing employ many workers.

Winnipeg is an important transport and trade center for all western Canada.

Education and Government. Heading the educational system is the University of Manitoba, at Winnipeg. The province's legislative assembly, with members elected for five-year terms, makes the laws and also names the premier. The Crown is represented by a lieutenant-governor.

History. The first settlement in Manitoba was founded on the Red River in 1812 by the Earl of Selkirk. The colony was opposed by the Northwest Fur Company. When this company was absorbed by the Hudson's Bay Company in 1821, the



CANADA'S HUGE "WHEAT FIELD"

Canadian Northwest was left in the hands of traders and trappers. In 1869 they rose in rebellion and resisted the incoming settlers, but fled when troops arrived. The following year Manitoba's government was set up under its present form. Winnipeg is the capital of the province. See WINNIPEG.

MANN, HORACE (1796-1859). A pioneer in the effort to provide good educational facilities for all, Horace Mann played an important part in the establishment of the common-school system of the United States. He was elected to the Massachusetts legislature in 1827, and continued to serve either in the lower house or the senate until 1837.

In that year he succeeded in having an important law passed, providing for a state board of education. Mann served as secretary of this board for twelve years, and secured the widespread adoption of many of his ideas because of the influence of his annual reports and articles in the *Common School Journal.* He also promoted the establishment of the Massachusetts State Normal School for the training of teachers, the first of its kind in the United States.

Mann was born in Franklin, Mass. Although he received a meager preliminary education, he prepared himself for college, and in 1819 graduated from Brown University with high honors. He studied law and was admitted to the bar in 1823. In 1848 he was elected to Congress, where he served for two terms. From 1852 until his death, he was president of Antioch College at Yellow Springs, Ohio.

MAN'OR. When feudalism held sway over Europe, the manor was the center of life. Here was the castle of the lord. Around the castle was a wall, within which were the houses of the freemen and the serfs. Outside the wall were the fields that were tilled by the serfs and freemen. The lord controlled everything concerning the manor; he made the laws, controlled milling and baking, coined money, and collected taxes and dues from the poorer residents of the manor. In his castle, courts were held, as well as banquets and festivals. See ABBEY; CHIVALRY; FEUDAL SYSTEM.

DEVOUT INSECT

Called praying mantis because of its position.

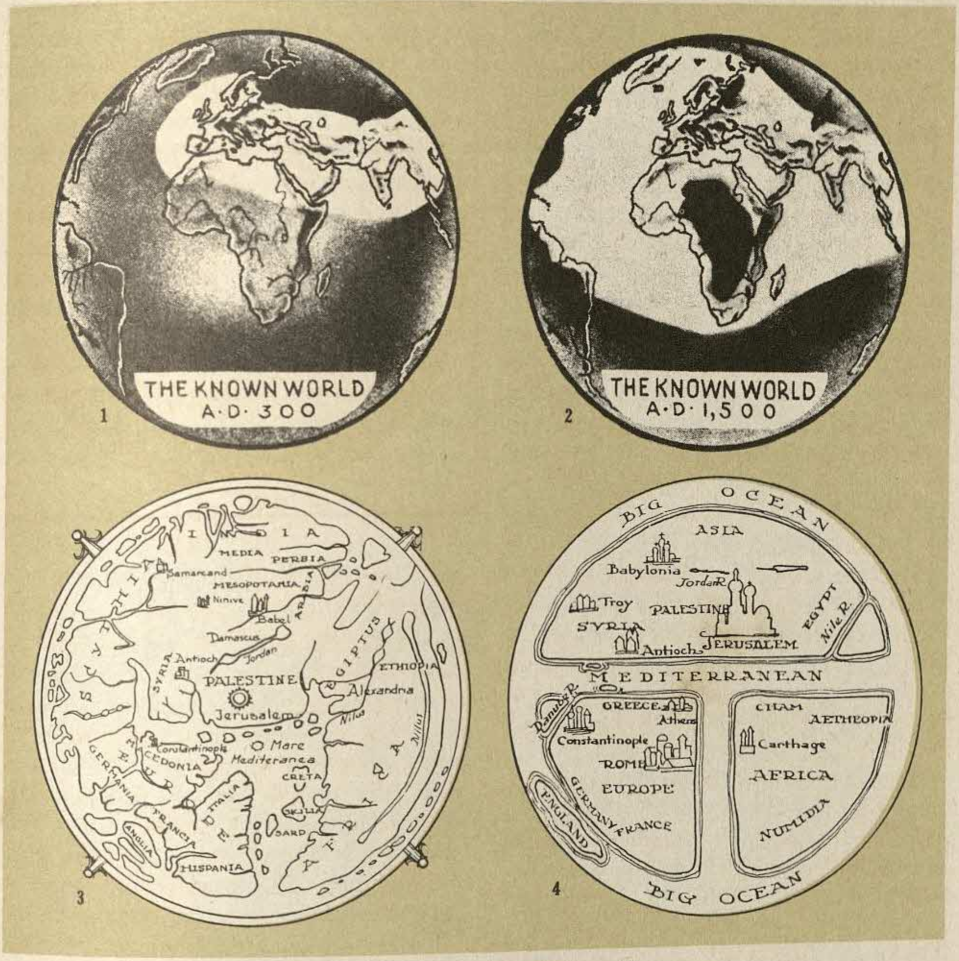
MAN'TIS. This insect derives its name from a Greek word meaning *diviner* or *prophet.* It is often called the *praying mantis,* because it holds its forelegs drawn up and bent as though in an attitude of prayer when it is watching for a victim to seize. The mantis lives on other insects. Most species are found in the tropics.

MAN'USCRIPTS are handwritten or typed matter. The word comes from a Latin word meaning *written by hand.*

The Babylonians and Assyrians used clay tablets on which to write. The Egyptians used papyrus. Parchment from animal skins was also used before paper became common in the 1300's. Black ink was made from lampblack, burned ivory, or bone. Colored inks were also used.

Before printing was invented in Europe in the 1400's, the monks of Europe produced beautiful illuminated manuscripts. Their illustration included specially designed capital letters, border design, and pictures. The illumination was done in gold, silver, and bright colors.

MAORIS, *mah' o reez.* Once fierce cannibals who struck fear into the hearts of the early voyagers to New Zealand, the Maoris today are numbered among the most advanced of the South Sea peoples.



FROM FICTION TO FACT IN NAVIGATION

Now that the world has been quite thoroughly explored, it seems remarkable that the adventurers of old ever found their way home. Their maps didn't help much. (1) Known world A.D. 300. (2) Known world twelve centuries later. (3, 4) Two maps made in the Dark Ages.

The Maoris are Polynesians, the name for peoples that inhabit the South Sea Islands. The Maoris tend to be tall and strong.

MAO TSE-TUNG, *mah' oh zu doong,* (1893-), Chinese Communist leader and dictator, was born in Changsha, China. He broke with the Nationalist movement in 1927, and became undisputed head of the Red Army and Communism in China. Communists and Nationalists co-operated against the Japanese in World War II, but after 1945, Mao drove Chiang Kai-Shek and the Nationalists out of China and established the People's Republic of China. Mao Tse-tung resigned in 1959 as head of the Republic, but retained leadership of the Communist party of China.

MAP. When the first explorers came to America they had to depend upon the Indians to guide them about. Sailors on the sea depend upon a compass. In a region where there are mountains and rivers, buildings and roads, however, it is much easier if one has a drawing or map that shows where the various features lie. The traveler can look at the map in the railroad folder or the automobile guidebook, or at the map of a city, and tell very quickly directions and distances of places.

There are many kinds of maps, used for different purposes. The automobile map may show only roads, buildings, and cities. Other maps show streams, hills, lakes, and islands, indicating the height of the land by color, shading, or contour. A map of this type is a *physical* map. Maps which just show the location of man-made features, as boundaries, cities, and roads, are *political* maps. Other maps show the distribution of people, forests, crops, mines, manufacturing industries, or rainfall.

The earth is a sphere, and the best map of it is the globe. But as globes are costly and inconvenient, and the scale too small for many purposes, we make most of our maps on a flat paper. But the surface of the earth is not flat any more than is the skin of an orange. Any map of the earth's surface must be adjusted to some degree. This fact makes it very difficult to draw an accurate map of a large section of the earth's surface on a flat paper. As a result, all such maps are more or less inaccurate.

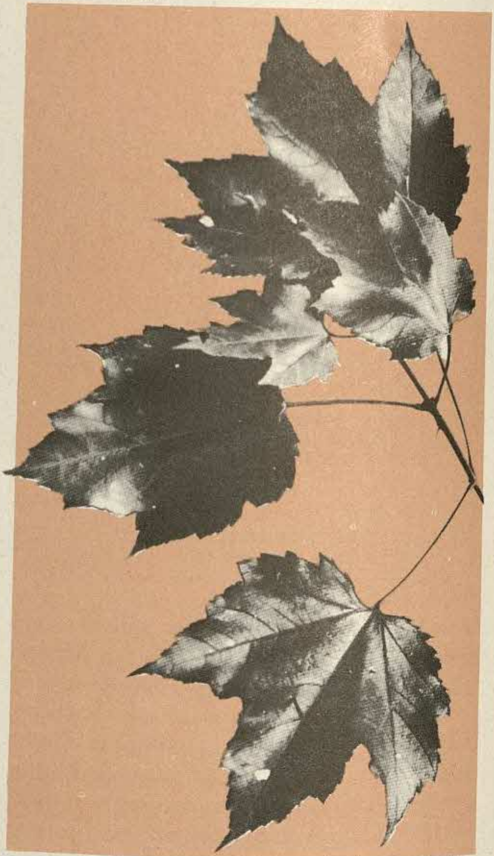
Two of the best-known types of maps are *Mercator's projection,* in which all the meridians and parallels are straight lines, and the *globular projection,* in which the meridians and parallels, except at the center, are made to curve. Since over small areas the curvature of the earth is small, flat maps of such areas are very nearly accurate.

Maps which show elevation or relief may use contour lines, colors, shading, or *hachures*. Hachures are small, short lines drawn to represent the slopes. They are used chiefly on foreign maps. If you examine the relief maps in a geography text, you will probably find examples of these various types.

One of the most recent developments in map making is the use of the airplane. A camera in an airplane takes pictures of the land over which the plane moves. The pictures are then pieced together and a map is made from them. It is claimed that maps of small areas can be made much more rapidly and cheaply by this method.

All sorts of devices are used to show the distribution of resources on a map. Thus a map may show the distribution of corn by dots, each dot representing a certain number of acres or bushels. The same plan is often used to show the density of population, the distribution of forests, or value of manufactured products. Rainfall and temperature distribution are usually shown by colors or shading.

On almost all maps in use today, north is at the top, east at the right, south at the bottom, and west at the left. This system greatly simplifies the use of all maps showing location.



U. S. Forest Service

SPRAY OF RED MAPLE LEAVES

MA'PLE. There may be many people who are unable to recognize the maple tree, but there are few who have not tasted maple sugar or syrup or have not seen furniture made of this wood. In all, there are about 100 known species growing throughout the temperate parts of Europe, Asia, and North America.

Maple trees are easily identified by their opposite branches, their palm-shaped leaves, which have from three to seven lobes, their fine-grained white wood, and their winged seeds. The most important American species is the *hard,* or *sugar,* maple, the sap of which is used for making maple syrup and maple sugar. Sugar maples are numerous in New England, New York, and Canada. The leaf of this tree is the official emblem of Canada. *Bird's-eye* maple is not a separate variety, but a knotted section of the hard maple. This beautiful white wood is filled with small dots resembling a bird's eyes, and its grain is wavy, not straight. *Curled* maple is another variation with wavy grain. Both of these varieties are used in furniture making, particularly for bedroom suites.

Aside from the sugar maple, the best-known American species are the *silver* maple, *red* maple, *mountain* maple, *box elder, triped* maple, and *Norway* maple. Maples are also commcn in Great Britain.

MARAT, *ma rah',* JEAN PAUL (1743-1793). To Jean Paul Marat goes a good deal of the responsibility for the tragic blood-spilling of the French Revolution. As editor of *L'Ami du Peuple,* his radical newspaper, he urged the people on to extreme measures at the beginning of the Revolution, and in 1792, when he assumed the leadership of the Jacobin party, he continued to advocate his policies. He became a member of the Committee of Public Safety in 1793, and urged even more executions than were being carried on at the time. Although acquitted of a charge of instigating an insurrection against the existing government, his bloody policies cost him his life. He was assassinated by Charlotte Corday. See FRENCH REVOLUTION.

MAR'ATHON. Twenty miles northeast of Athens, Greece, is a stretch of level land that borders on the Aegean Sea. Outwardly, there is nothing unusual about this plain and the tiny village near by, but in history it stands as a monument for all time. Here, in 490 B. C., Miltiades, with his small Athenian army, defeated the Persian horde under Darius, sounding the death knell of Persian conquest in Europe and removing the danger of Asiatic control over the continent.

Every four years, the world honors this memorable struggle with a marathon race at the Olympic Games. The contest takes its name from the site of the battle, and is based on the famous run made by Pheidippides, an Athenian runner who was sent from the battlefield to Athens to spread the news of victory Exhausted by his long run, Pheidippides managed to utter the anxiously awaited words of victory, then fell dead. See FIFTEEN DECISIVE BATTLES; OLYMPIC GAMES.

MAR'BLE. Many fine buildings, exquisite statuary, and the most beautiful of stone decorations are executed in marble. This beautiful stone takes a high polish, it has an infinite variety of coloring, and will respond easily to the workman's chisel.

Marble is merely limestone that has undergone a great change: by the heat of the earth, it has become crystallized, purified, and finer-grained. Pure marble is snow white, although there are many varieties of the stone in colors, because of the foreign substances staining the rock. The black, blue, and red varieties get their color from organic matter; the cream-colored and yellow varieties, from oxides of iron; and the greenish marbles, from iron-silicate materials. The best of the pure marble comes from Italian quarries at Carrara, which have been operated constantly for over 2,000 years. Extensive marble deposits are found in Vermont, Massachusetts, Maryland, Georgia, Tennessee, and Missouri. There are other valuable quarries of this stone in Alaska, California, Colorado, and Arizona.

In the quarries of the United States, very little work is done by hand and there is but scant waste of the stone. Deep grooves are cut into the marble by means of a channeling machine, and numerous holes are drilled along the uncut bottom. The blocks are then split loose with wedges. Explosives are never used. In the foreign quarries, however, old-fashioned hand methods and blasting are still resorted to in getting out the stone.

Pure-white marble is used almost exclusively in statuary; the colored varieties are usually employed in building stone staircases, marble floors, and soda fountains, and in wall paneling. Marble is a poor outdoor material, for it is dissolved by rain and weathers badly. Old marble tombstones, for this reason, have become almost undecipherable after sixty or seventy years. Granite is usually used for gravestones today. One of the most interesting forms of marble is *Mexican onyx,* produced in caves by the formation of limestone stalactites and stalagmites. This material is frequently employed in making vases, tabletops, and small statuary. See LIMESTONE.

MARBLES. A game universally played by boys is marbles. It is played with small balls, or marbles, which are made from marble, onyx, baked clay, glass, and other hard substances. The beginning of the marble "season" is a certain sign of spring, for boys begin to play the game as soon as winter ends, and continue to play it for several weeks before they put their marbles away to await the next spring. Marbles is an ancient game and is played according to various rules, depending to a certain extent upon the locality in which it is being played.

The familiar bull's-eye and striped marbles are molded in clay before they are baked, painted, and glazed. Great numbers of common marbles are made in Saxony from a hard limestone; after they are rounded and smoothed, they are polished. Oberstein, Germany, is a center for the manufacture of agate marbles, made by pressing the hot glass into metal molds. Most of the onyx marbles made in the United States come from Akron, Ohio.

MARCH. Named for the stormy Mars, Roman god of war, March, the third month of our year, is frequently windy and blustering. March 21 officially marks the first day of spring, but so often are its bright, balmy days followed by gloomy, stormy ones that the Italians have a proverb, *Marzo e pazzo* ("March is crazy"). March in the Roman calendar was the first month of the year, and in England until 1752 New Year's Day was celebrated on March 25. Ancient calendars allotted thirty-one days to the month, the same number as do our modern calendars. The violet is the flower of the month, and its gem is the bloodstone, or heliotrope. See CALENDAR.

WORLD WELDER

Through the wireless-telegraphy inventions of the Italian genius Marconi, world-wide communication has become a matter of seconds.

MARCO'NI, GUGLIELMO (1874-1937). Radio, twentieth-century marvel that takes a place along with the electric light, the automobile, and the airplane as one of the greatest influences on modern civilization, was perfected and made commercially possible by Guglielmo Marconi, Italian inventor. Born and educated in Bologna, Marconi began experimenting with wireless telegraphy early in his career, and in 1901 sent the first wireless message across the Atlantic Ocean. Three years later, he established a radio news service on the transatlantic liners, and in 1907 founded the regular radio service between the United States and England.

In 1909 Marconi received the Nobel Prize in Physics for his inventions, and in 1929 he was created a marquis by the king of Italy. See RADIO.

MAR'CO POLO. See POLO, MARCO.

MAR'CUS AURE'LIUS. See AURELIUS, MARCUS.

MARIA LOUISA, *ma re'ah loo e'zah* (1791-1847). Taken in marriage by Napoleon after the defeat of Austria in 1810, Maria Louisa was the emperor's second wife. She was the daughter of Francis I of Austria. After Napoleon's defeat in 1815, she received the duchies of Parma, Piacenza, and Guastalla, which she ruled until her death. See NAPOLEON I.

MARIANA, *mah re ah' nah,* **ISLANDS.** See LADRONE ISLANDS.

MARIA THERESA, *ma re' ah te re' sah* (1717-1780). Europe was plunged into an era of war and bloodshed when Maria Theresa ascended the throne of Austria, Bohemia, and Hungary in 1740. Her father, Charles VI, had provided for her rule by the Pragmatic Sanction, but his death was the signal for Prussia, Spain, Naples, France, and Bavaria to carve up the empire that possessed so much of the continent.

In 1740 Frederick the Great of Prussia seized Silesia, while Naples and Spain gained the Austrian possessions in Italy. French and Bavarian troops marched into Bohemia, and it appeared that the young queen would soon have no empire. She was saved, however, by Hungary, whose legislature heard her pleas for aid. The Hungarians drove out the French and Bavarians, and Frederick concluded a peace which gave him Silesia. By the Treaty of Aix-la-Chapelle, Maria Theresa's husband, Francis I, was acknowledged emperor of Austria.

A period of peace followed, and during that interval Maria Theresa, her husband, and her minister Kaunitz instituted reforms which gave the peasants more freedom, restored the finances, and rehabilitated the empire generally. In 1756, however, Frederick the Great precipitated the Seven Years' War by invading Saxony, and Austria again bore the brunt of the struggle. But when it was over, the empress once

MARIE ANTOINETTE GOES TO HER DEATH

The proud and pleasure-loving wife of Louis XVI was said to be a fond mother, but unfeeling toward the suffering masses of eighteenth-century France. Head high, she is shown riding with her priest in the crude cart that carried her to the guillotine. She was executed by Revolutionists in 1793.

AUTUMN'S BRILLIANCE
Long after most of the late flowers have faded and gone, marigolds continue to bloom.

more devoted her efforts to improving conditions in her realm. Upon the death of her husband in 1765, her son, Joseph II, took part in ruling the empire. Seven years later, when Poland was dismembered, Maria Theresa obtained Galicia for Austria. In 1777 she added more territory to Austria by acquiring Bukowina from Turkey.

Maria Theresa had sixteen children, ten of whom survived. One of them was the unfortunate Marie Antoinette, who became the queen of Louis XVI of France.

For additional information, consult the following articles:

Aix-la-Chapelle
Charles VI
Seven Years' War
Succession Wars

MARIE ANTOINETTE, *ma re′ ahN-twa net′* (1755-1793). Symbol of all that was hateful to the common people, Marie Antoinette, the beautiful wife of King Louis XVI, was one of the most colorful figures of the French Revolution. She was the youngest daughter of Francis I and Maria Theresa of Austria, and married Louis at the age of fifteen.

Marie Antoinette was a vigorous opponent of any reform which would have benefited the people of France, and she used her influence over Louis to persuade him from taking any measures to improve their condition. When the Revolution broke out, the royal family at first was not affected; but the regal manners of Marie angered the populace, and the king and queen were imprisoned in the Tuileries. She is believed to be the one who planned the unsuccessful escape in June, 1791. In January, 1793, Louis was executed, and she followed him to the guillotine later, after defending herself with vigor at her trial.

To her credit, it must be said that she behaved courageously and proudly while a captive; and even the most bitter of the Revolutionists admired her composure on the day she was led to her death. Some persons have pictured Marie Antoinette as a saint and a martyr. Others describe her as a selfish, narrow person without pity. Probably neither opinion is justified, but historians have debated the question ever since the knife of the guillotine blotted out her life. See French Revolution.

MAR′IGOLD. What an exquisite name, "Mary's Gold"! The old favorites of the flower garden surely deserve the honor, because many of the varieties are like balls made from flakes of gold. How well they grow and how easily we may have masses of "Mary's Gold"!

There are three principal kinds of marigolds. The *African* marigold is a tall sort; the *French* marigold is a dwarf type with an abundance of rich golden-brown and maroon painted upon the flowers. There is another dwarf marigold with finely divided leaves and tiny golden flowers.

The main charm of the African marigolds depends upon their large, fully double flowers, and if one keeps one's own seeds, it is wise to pull up from the garden all that do not come up fully double.

MARINE CORPS, *ma reen′ kore.* "First to fight," the marines are the "soldiers of the sea" who serve as protectors of America's rights and interests the world over.

THE REVOLUTION'S "SWAMP FOX" IN ACTION
In the Revolutionary War, Marion harried the British by skillful guerrilla warfare.

Although they are trained as soldiers and participate in wars and other disturbances as soldiers, the marines are a part of the navy, commanded by a general, who is directly responsible to the Secretary of the Navy. If the President deems it desirable, he may, however, detach the corps from the navy and assign it to duty elsewhere.

The Marine Corps has played a major role in every American war. Among other things, it has assisted the navy and the army in carrying out landing operations and other missions and has guarded the nation's naval and shore properties. In peacetimes it has also served as a police force at home and abroad when unrest has endangered American lives and property. Because its duties are so varied, it embraces practically every type of service, arms, and equipment found in a modern army. The corps' readiness to fight on land, at sea, or in the air is symbolized by its insigne — a "globe" backed up by an anchor and topped by an eagle. The same sentiment is expressed in its stirring hymn, "From the Halls of Montezuma to the Shores of Tripoli," and in its famous motto, *Semper Fidelis,* meaning *Always Faithful.* The Marine Corps Women's Reserve, organized in 1943, became a permanent branch in 1948. The United States Marine Corps has been in existence since 1798.

MA'RION, Francis (1732-1795). Guerrilla tactics that were overwhelmingly successful won for Francis Marion, American military commander in the Revolutionary War, the title of "the Old Swamp Fox." With his own cavalry, Marion harassed the British continually in South Carolina, winning victories at Nelson's Ferry in 1780 and at Eutaw Springs the next year. Previously, he had been a member of Colonel William Moultrie's regiment when it occupied Fort Sullivan (later known as Fort Moultrie), and shortly afterward was placed in command of the fort. He became a member of the South Carolina senate after the war.

MARK. A German monetary unit, the mark is comparable to the American dollar. It became the official monetary unit of the German Empire organized in 1871. At first a silver coin, representing the value of 0.3584 gram of gold, it was later made of nickel. Shortly after World War I, inflation destroyed the purchasing power of the mark, and a new unit — the reichsmark — with a value of about 24 cents was established. With the defeat of the Nazi regime and the Allied occupation of West Germany after World War II, the reichsmark was replaced by the Deutschemark, which had a fixed exchange value of about three to the dollar. The old European mark denoted eight ounces of silver or gold.

MARK, Saint. The earliest of the four gospels in the New Testament was written by Mark, the evangelist who is mentioned in the *Acts of the Apostles* as "John, whose surname was Mark."

He was the companion of Paul and Peter in the early work of the Church, and learned much of the teachings of Jesus from Peter. He himself is believed to have been present at some of the events in Jesus' life. Just when Mark wrote his gospel is not known, but it was probably within thirty or forty years after the Crucifixion, thus coming closer to the actual ministry of Jesus than any of the other three gospels.

MARK ANTONY. See Antony, Mark.

MARKETING. Many people refer to marketing simply as the process of distributing and selling goods. However, modern marketing includes all business activities from the point of production to the point of consumption, including the four important economic divisions, production, distribution, exchange, and consumption.

Marketing is the business of getting goods from producer to consumer. This is done chiefly by the functions of buying and selling, although other factors are involved, such as advertising, grading, packaging, storing, and transporting. The producer or manufacturer may sell his merchandise direct to the consumer, but more usually he uses the services of a middleman, such as a wholesaler, who supplies the retail merchant; the retailer, in turn, supplies the consumer.

The term *market price* usually refers to the selling price of goods. It is arrived at by finding the highest price at which the most goods can be sold at the most profit. For example, if an item costs four dollars to make, at a selling price of five dollars perhaps seventy people would buy; at seven dollars, thirty-five people; and at ten dollars, fifteen people. Under normal conditions, the highest profits would be obtained if the selling price of this article were seven dollars.

For further information, consult also the following titles:

Advertising
Chain Stores
Consumption
Distribution
Economics
Exchange
Production
Supply and Demand

MARK TWAIN. See Clemens, Samuel Langhorne.

MARL. Formed by the decay of tiny sea animals or by the activities of certain weeds, marl is one of the world's most ancient fertilizers. It is a mixture of carbonate of lime and clay, and the quantities of these two ingredients vary greatly in different types of marl. It is obtained along the seashore or at the bottoms of lakes or marshes. Michigan and New York are the leading producers of dried marl. It is used today only where it can be placed on the ground more cheaply than equivalent values of the usual commercial fertilizers. Slaked lime is one of the chief substitutes for marl.

MARL'BOROUGH, John Churchill, first Duke of (1650-1722). England's hero in the War of the Spanish Succession was John Churchill, Duke of Marlborough. Through his marriage to Sarah Jennings, an attendant to Princess Anne, he became an influential member of the court of William III, and was appointed commander of the English forces sent to Holland.

When Anne became queen, in 1702, Churchill retained his command, defeated the French in Holland, and captured Liege and other cities. In honor of these victories

WHEN THE NOBLES FOUGHT THEIR OWN BATTLES
In 1709 the Duke of Marlborough took an active part in defeating the French at Malplaquet.

he was created Duke of Marlborough. His triumph at Blenheim over the French and Bavarians, and those that followed at Ramillies, Oudenarde, and Malplaquet, won him additional glory. Although he was temporarily in disfavor with Anne, because of a quarrel his wife had with the queen, he was restored to command by George I, who followed her to the throne. See SUCCESSION WARS.

MAR'LOWE, CHRISTOPHER (1564-1593). Famed for his tragic dramas, the best known of which is *Dr. Faustus,* Christopher Marlowe, poet and dramatist, was one of the greatest English literary figures before the time of Shakespeare. His *Tamburlaine,* the first important English work written in blank verse, served as inspiration for the later work of Milton. Born at Canterbury and educated there and at Cambridge, Marlowe had his promising literary career cut short when he was killed in a quarrel. His other works include the plays *Edward II* and the *Jew of Malta,* and a poem, *Hero and Leander.*

MARMORA, *mahr' mo ra,* or **MARMARA,** SEA OF. Lying between European and Asiatic Turkey, the Sea of Marmora is also located midway between the Aegean Sea and the Black Sea. One hundred sixty miles long and fifty miles wide, the Marmora is connected with the Black Sea by the Bosporus and with the Aegean by the Dardanelles. The sea contains several islands, the largest of which is Marmora, important for its marble and alabaster quarries. See DARDANELLES, THE.

MARNE RIVER. One of the best-known rivers in France, chiefly because several critical battles of World War I

AN ALTAR IN THE AMERICAN WILDERNESS
Brave Father Marquette combined his missionary work with valuable exploration trips.

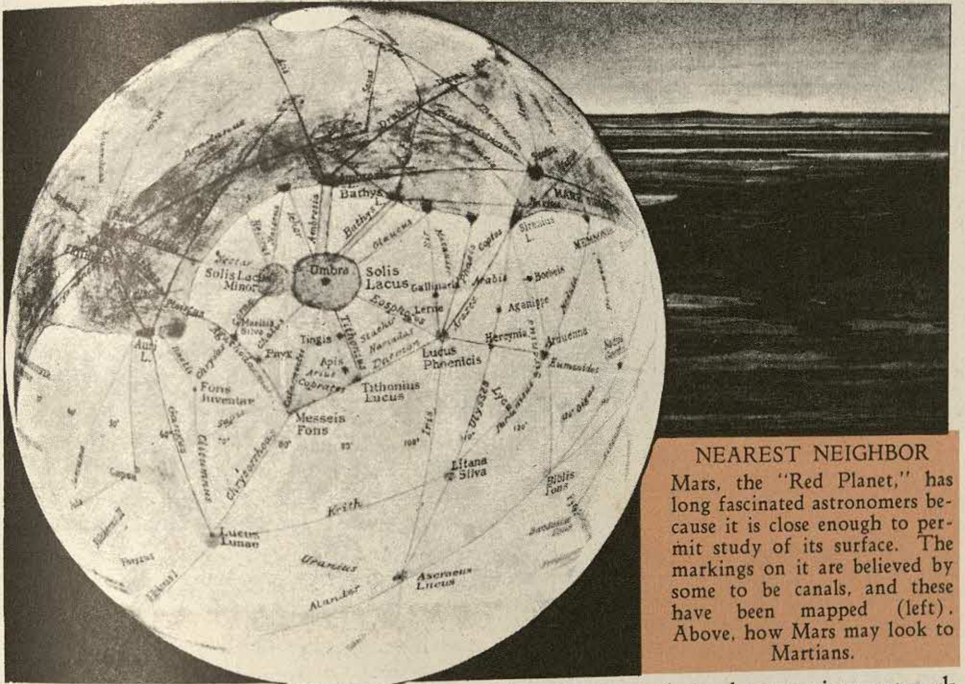
were fought along its banks, the Marne is a valuable commercial stream rising on a high plateau and flowing to the northwest for 325 miles, until it joins the Seine River near the city of Paris. It is navigable for more than half of its length. Several large tributaries give it a swift current that furnishes water power for factories. Its commercial value is enhanced by a number of canals.

The Marne River marked the point of the farthest advance of the German armies in 1914. The Germans, attempting to enter Paris, met the French there in a series of fierce encounters that came to be called the Battle of the Marne. The second Battle of the Marne ocurred in 1918, when again the German army was threatening Paris. See WORLD WAR I.

MARQUESAS, *mahr ka'sas,* **ISLANDS.** Discovered about the year 1595, the Marquesas Islands are a volcanic group, thirteen in number, that lie in the South Pacific more than 3,000 miles due west of the Peruvian coast in South America. The total area of the islands is about 480 square miles. The northern islands were seen by Captain Ingraham in 1791, and he named them the Washington Islands. The United States, however, did not attempt to exercise control over them, and they became French territory about the year 1842. The population is about 2,700.

MARQUETTE, *mahr ket',* JACQUES (1637-1675). If all white men who came to America in the early days of exploration had been like Father Marquette, the settlement of the New World would have been accomplished with less bloodshed and strife than history records. Unselfish, kind, lovable, and saintly, this Jesuit missionary won the confidence and respect of white men and Indians alike. He was, moreover, one of the first to explore the Mississippi and establish a trade route from the Saint Lawrence to the Gulf of Mexico.

Father Marquette came to America in 1666, and, after studying the language and customs of the Indians for two years, was sent as missionary to the Ottawas. He established a mission at Sault Sainte Marie; but when the Iroquois drove the Ottawas and Hurons out of the land, he accompanied them to Mackinac, where he founded



NEAREST NEIGHBOR

Mars, the "Red Planet," has long fascinated astronomers because it is close enough to permit study of its surface. The markings on it are believed by some to be canals, and these have been mapped (left). Above, how Mars may look to Martians.

another mission. From wandering Indians, chiefly those from the Illinois tribes, he heard of a great river that flowed southward. Interested not only in a mission among the Illinois, but also in this river, he gladly joined an expedition led by Joliet, for the purpose of finding the stream.

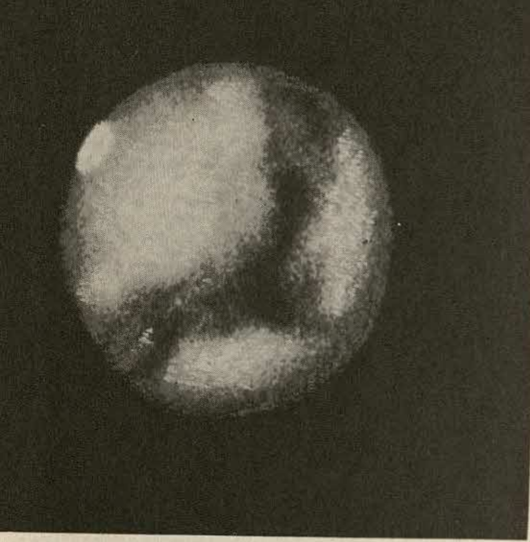
The expedition started in 1673 from Mackinac. After crossing Lake Michigan to Green Bay, the party portaged to the Fox River and then went down the Wisconsin to the Mississippi. In canoes, the little group of Frenchmen and Indians paddled down the river as far as the point where the Arkansas joins the "Father of Waters," then turned back, realizing now that the ever-widening stream flowed into the sea. Marquette went up the Illinois River and returned to Mackinac, where he endeavored to regain his lost health and write an account of the journey. Feeling strong again in 1674, he set out to found a mission among the Illinois; but his health failed him again, and he died in the wilderness, beloved by all who knew him.

MARS, *mahrz.* Are there men living on Mars? Are there Martian supermen who have built on their planet a giant network of canals?

The question has interested astronomers and intrigued novelists and their readers for years. Most scientists today agree that no high form of life can exist on Mars, for they doubt whether life could flourish in a world so lacking in moisture as Mars, and in such severe extremes of temperature. This we know: that if a man who weighs 150 pounds on the earth should visit Mars, he would weigh only fifty pounds there, for the pull of gravity on Mars is only one third as great as on our planet.

Mars is the fourth planet from the sun, about which it travels once in every 686 of our days; it is the next to the smallest of the planets. As it swings about its orbit, Mars comes within 35,000,000 miles of the earth every fifteen to seventeen years, and on these occasions astronomers focus their telescopes on this neighbor and try to detect signs of vegetation or animal life, and to determine the meaning of the indistinct web of straight lines that covers its face.

Once these lines were thought to be canals, and the gray and white irregular



Yerkes Observatory

MYSTERIOUS PLANET
Ice caps and dark markings are visible on Mars.

patches were thought to be areas of land and water; but these surfaces now are believed to be rough and mountainous; and our scientists find little trace of moisture in the thin atmosphere around Mars. Around the two poles of Mars white caps have been observed, which vanish in the summer. Some astronomers believe they are ice caps; but if it is true that there is little moisture on that planet, the caps may be white fields of condensed or frozen gases.

The diameter of Mars is only about 4,190 miles, compared with the earth's 8,000-mile diameter. Named for the Roman god of war, it shines with a reddish light, startlingly brilliant when it approaches the earth, vaguely pink when it travels to the other end of its orbit, 63,000,000 miles from us. Its distance from the sun varies from 126,000,000 to 152,000,000 miles. Its *day* is twenty-four hours, thirty-seven. minutes, twenty-two seconds long; its seasons are nearly twice as long as ours, because of its 687-day swing around the sun. Warm by day, Mars is extremely cold at night. The mass of the planet is only about one tenth that of the earth.

Two of the tiniest heavenly bodies ever observed were discovered whirling about Mars by Professor Asaph Hall of the Naval Observatory at Washington in 1877. The smaller of these two satellites, Deimos, is only about five miles in diameter. The larger, inner satellite, called Phobos, is perhaps ten miles in diameter. Deimos, with a diameter of about five miles, circles Mars

THIS ANCIENT SPECTER STILL MENACES THE WORLD
For he is Mars, the god of war. According to Roman mythology, he was a cruel and relentless warrior, greatly feared by those who worshiped him. He was supposed to be the father of Romulus. Now, after thousands of years, Mars lives only as a symbol of strife.

in approximately thirty-one hours. Phobus makes the round in about seven and a half hours. See ASTRONOMY; PLANET; SOLAR SYSTEM.

MARS. The fierce and powerful god of war who loved the clamor and destruction of battle was called Mars by the Romans and Ares by the Greeks. He was especially venerated by the Romans, who believed that his son, Romulus, had founded the city of Rome. Great temples were erected to Mars; and because his wrath was much feared, sacrifices, sometimes of human beings, were frequently offered to him. He was the son of Jupiter, king of the gods.

MARSH. When water cannot run off, evaporate, or sink through the ground to a lower level, a marsh results. In America, the terms *bog, swamp,* and *marsh* are all used interchangeably; in Europe, however, bogs are regarded as those lands that are the source of peat. Marshes are usually found in the vicinity of a spring or rivulet, where its waters cannot escape. Such a place is usually level, though hillsides may also be marshy. In such a case, the ground may become loosened and break away, causing a landslide.

One interesting type of marsh is found along the low, level ocean shores, where salt marshes are common. In the Everglades of Florida, the sea runs into a dense forest during high tide, again withdrawing as the tide recedes. Marshes are of value agriculturally only when drained, except that rice is cultivated in marshy land. The cypress swamps of Louisiana and the lower Mississippi are good examples of how an overflowing river can cause a perpetual marsh. A "dying" lake becomes a marsh before becoming completely dry.

MARSHALL, GEORGE CATLETT (1880-1959). General of the Army Marshall became the first professional military man ever to direct American foreign policy, when he succeeded James Francis Byrnes as Secretary of State in January, 1947. He was born in Uniontown, Penn., in 1880, and graduated from the Virginia Military Institute in 1901; he served with American Expeditionary Forces in World War I, 1917-1919. In September, 1939, President Roosevelt appointed Marshall Chief of Staff — a position he held until November, 1945. He was made General of the Army in December, 1944. Marshall resigned as Secretary of State in 1949, took the new post of Secretary of Defense in 1950, and retired in 1951.

MAR'SHALL, JOHN (1755-1835). If George Washington was captain of the American ship of state at its launching, John Marshall may be called the navigator. For his decisions as Chief Justice in the formative period of the United States had a powerful influence in steering a course for the Federal government under its new Constitution. He presided over the Supreme Court from 1801 until his death.

Most famous Chief Justice in the nation's history, Marshall was born at Germantown, Va. He served honorably in the Revolutionary War, attended lectures in law at William and Mary College in 1780, and was admitted to the bar in 1781. Soon he was elected to the Virginia legislature and was influential in the Virginia convention which ratified the Federal Constitution.

Marshall supported the Washington administration from the sidelines, refusing any government office until 1797, when he went with Gerry and Pinckney on a mission to France. A year later he was elected to Congress, and in 1800 was chosen Secretary of State.

He is noted for his interpretations of the Federal Constitution which established important precedents. Eminent among these decisions was his opinion in the Dartmouth College case, involving the sanctity of state contracts.

MARSH HAWK, or HAR'RIER. A strong flier, the marsh hawk is a bluish-gray bird that hunts over marshy regions and wet ground. It is valuable to the farmer because it destroys many insect pests and small, predatory animals. The female and young are brown with white spots on the tail. The marsh hawk nests on the ground.

MARS HILL. Lying west of the Acropolis in ancient Athens, the hill of Mars (or Ares) was the scene of the meetings of the Areopagus, a court of justice in the Greek city. Paul also preached to the Athenians from the hill. The origin of the name is not known, but the hill was not consecrated to the worship of Mars.

MARSH MAL'LOW. A member of the mallow family, the marsh mallow grows along the salty marshes of the New England coast. Its roots are large and white, rich in a mucilage-like substance of value medicinally and in the confectionery trade. The plant grows from two to three feet high. Both leaves and stem are down-covered, and the flowers are pinkish in color.

MARSUPIA'LIA. Among the lower orders of mammals is the group *Marsupialia,* in which the young are extremely small and undeveloped at birth. The tiny, helpless baby marsupials are usually picked up by the mother and placed in a pouch on the outside of her abdomen. This pouch is formed by a fold in the skin which partly encloses the milk glands. The young become attached by their mouths to the teats, the milk being forced down their throats for a considerable time by a pumping action of muscles within the glands.

Marsupials are animals of little intelligence and are generally slow-moving, awkward creatures. At the present time, with the exception of the American opossums and an aquatic form which occurs in parts of South America, marsupials are found only in Australia and the surrounding islands. The kangaroo is one of the best-known members of this strange group of animals, and may be seen in several of the zoölogical gardens in the United States. The wombat, koala, and vulpine phalanger, or Australian opossum, are also among the better-known marsupials.

USEFUL FOR HIS COAT
Martens are trapped for their rich, brown fur.

MAR'TEN, or AMERICAN SABLE. Varying in color from light tawny to a rich, dark brown, the martens are long, slender animals of the weasel tribe. Their rich coats are among the most highly prized fur products from the forested regions of North America.

The favorite haunts of martens are in deep, dense forests where, with tireless energy, they pursue their prey on the ground or, with amazing speed and skill, on fallen trunks and in the treetops. Few animals can equal them in the restless swiftness with which they dart hither and thither. Martens are bloodthirsty and relentless, but apparently they kill to secure their food, not merely to satisfy a wanton cruelty.

MARTIAL, *mahr'shal,* **LAW.** Sometimes during severe local disorders, military forces are called in to restore order. At such times the military commander assumes full charge of the government, and military law temporarily replaces civil law. When the local officials find conditions beyond their control, as during race riots, labor troubles, and floods, they may appeal to the governor of the state for state militia, or the National Guard, to restore order. When the troops arrive on the scene, action is taken as though a state of war existed. Streets are patrolled and the movements

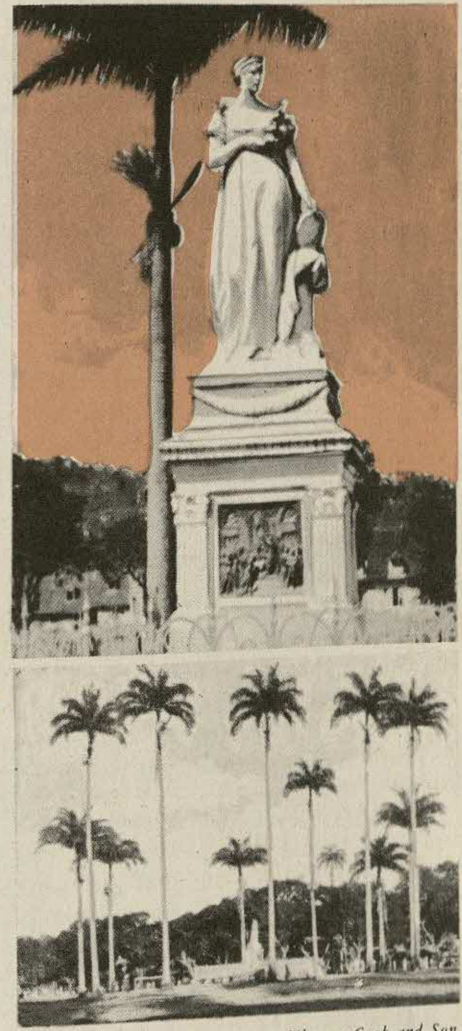
PLUCKY FIGHTER

The purple martin, largest of the swallow family, is notably courageous; will even fight hawks and crows in defense of its home.

and hours of citizens are restricted. All orders of the militia, regardless of how exacting they may be, must be obeyed in the interests of common welfare.

MAR'TIN, or PURPLE MARTIN. This is the bird that nests in the many-holed birdhouses which one sometimes sees on poles about buildings in cities and villages and in country districts. It is the largest North American swallow, being about eight inches long. The male is a shining blue-black all over; the female has a grayish throat and under parts.

Martins range in summer throughout the United States and Southern Canada. They are interesting and useful birds to attract to the farm and garden, and greater efforts should be made to encourage and protect them. They feed on insects caught on the wing, such as flies, ants, and beetles of various kinds. Martins are migrating birds. They winter in South America.



Top, courtesy Thomas Cook and Son
Below, courtesy Cunard White Star Ltd.

FRANCE PLUS AFRICA . . . .

equals Martinique, a charming, sunny island in the Caribbean Sea. Top, statue of the Empress Josephine. Below, an island park.

MARTINIQUE, *mahr te neek'.* Just 350 miles southeast of Puerto Rico is the little French island of Martinique, little known commercially, but famed for the terrific eruptions of its destructive Mount Pelée. Only forty miles long and from ten to fifteen miles wide, it covers some 485 square miles and has about 265,000 inhabitants, mostly of mixed Negro stock. It is irregular in shape, rough and rugged of contour, and over all towers threatening Mount Pelée to a height of 4,428 feet. Though hot and moist, Martinique is healthful. The principal crops are coffee, fruits, cacao beans, and sugar cane.

The island was discovered by Columbus but was not settled until 1635, when France established a colony there. In 1902 two terrible eruptions wiped out the city of Saint Pierre, killing about 35,000 people.

MARX, *mahrks,* KARL (1818-1883). A political theorist whose ideas have influenced the lives of millions, Karl Marx interpreted all individual and national life from an economic standpoint. His teachings concerning the rights of the working classes form the bases of present-day socialism. Marx was born in Trier, Germany, of Jewish parents, and received his training in law and philosophy at the universities of Bonn and Berlin. In his early years he published a liberal paper in Cologne, and later, one in Paris. Forced to flee to Belgium in 1845, in Brussels he collaborated with Friedrich Engels, another revolutionary thinker, in writing the *Communist Manifesto.*

During the revolutions of 1848, they returned to France and Germany, but were forced to leave those countries because of their radical activities. Marx then went to London. In 1864 he established the *First International,* or the International Workingmen's Association. The present communist and socialist philosophies accept the doctrines of Marx as set forth in the *Communist Manifesto* and *Capital* (published in 1867), and the government of Soviet Russia, a dictatorship of the working classes, is based on his theories. See COMMUNISM; SOCIALISM.

MARY, THE VIRGIN. Portrayed in great works of art as a gentle and dignified mother, the Virgin Mary, mother of Jesus, first appears in the New Testament in the story of her betrothal to Joseph and in the account of the birth of Jesus. She is later mentioned in the period of Christ's ministry on earth and once after His death. The Assumption of the Virgin Mary was declared a dogma of the Catholic Church in 1950. See ART, RELIGIOUS; MADONNA.

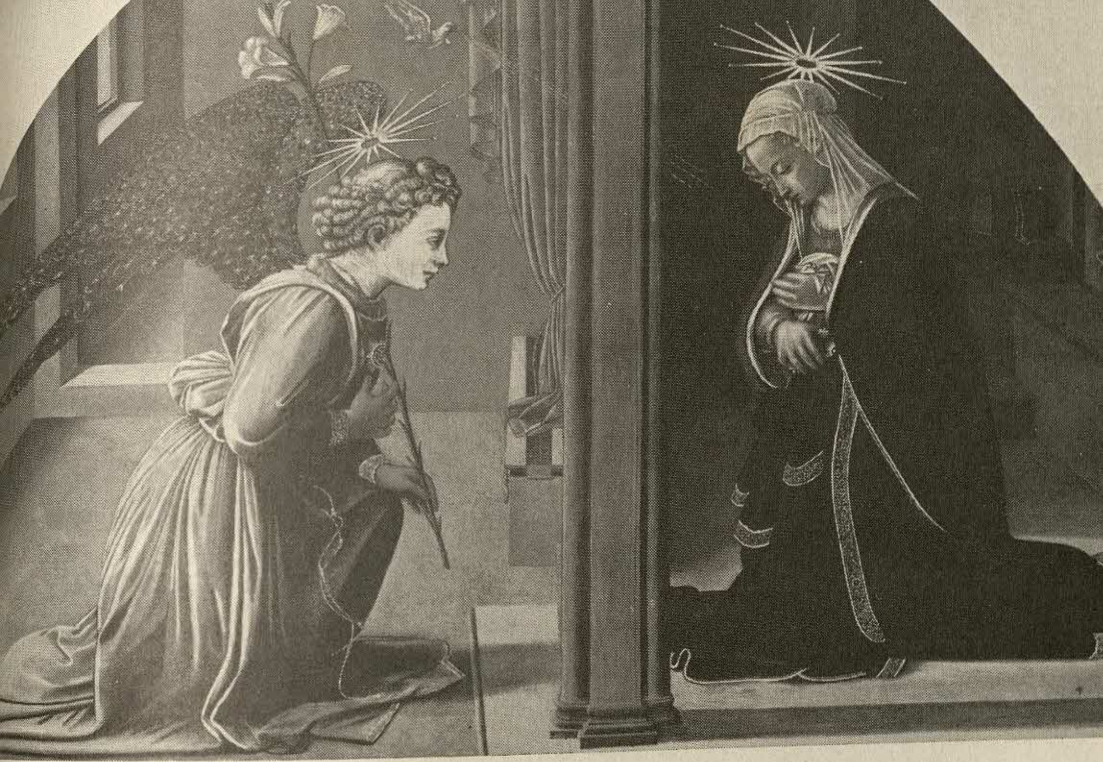
MARY I (1516-1558). Ascending the English throne at the death of her brother Edward VI in 1553, Mary I, daughter of Henry VIII and Catherine of Aragon, restored the Catholic faith, which had been banned by her predecessors. This move sowed discontent among the people, and her marriage to Catholic Philip II of Spain produced great dissatisfaction. A war with France, undertaken on Philip's advice, resulted in the loss of Calais, which had been in English hands for more than 200 years. Mary was succeeded by her half sister, Elizabeth.

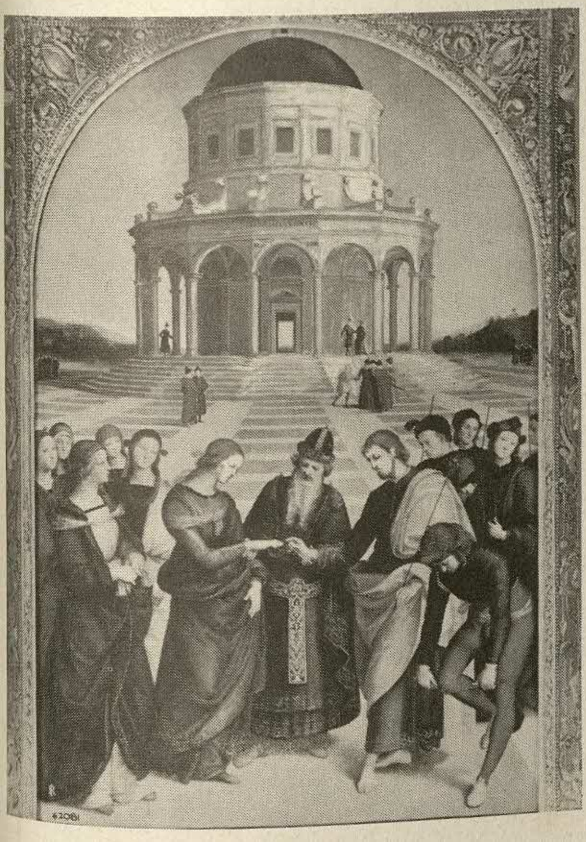
MARY II (1662-1694). After James II had been deposed by the Revolution of 1688, his daughter Mary, who had married William of Orange in 1677, ascended the throne of England as joint ruler with William. See WILLIAM III.

MARYLAND. One of the original thirteen states of the Union and one of the smallest is Maryland. With fertile soil, it is a rich, productive region noted for its valuable agricultural products. Maryland has long played an important part in the history of the United States; and its popular name, "the Old Line State," refers to the brave service rendered by the Maryland Line in the Revolutionary War.

Maryland is almost split in two by Chesapeake Bay. To the north lies Pennsylvania; to the east are Delaware and a short strip of the Atlantic; and south and west across the irregular boundary of the Potomac River are Virginia and West Virginia. With an area of 10,577 square miles, Maryland ranks forty-second in size among the states.

Surface Features. To the east of Chesapeake Bay and the Susquehanna River, which empties into the bay, is a region known as the coastal plain. The surface here is low, level, and fertile, and the soil is generally sandy. The northern part of the coastal region rises to low hills. In the north-central section, west of Chesapeake Bay, is the Piedmont Plateau, rolling and





THE GLORY OF THE BLESSED VIRGIN has been celebrated by generations of artists. On these four pages are masterworks depicting events in the life of Mary. First page: "The Annunciation" by Fra Filippo Lippi (top) and "The Marriage of the Virgin" by Raphael (bottom). Second page: "The Nativity" by Correggio. Third page: "The Alba Madonna" by Raphael (top), "The Miracle of the Palm Tree" by a Spanish sculptor of the Renaissance (center), and "Pieta" by the modern American sculptor Faggi (bottom). Fourth page: "The Assumption of the Virgin" by El Greco.

CREDITS: 1st page: National Gallery of Art, Kress Collection
3rd page: National Gallery of Art, Mellon Collection; The Metropolitan Museum of Art; The Art Institute of Chicago
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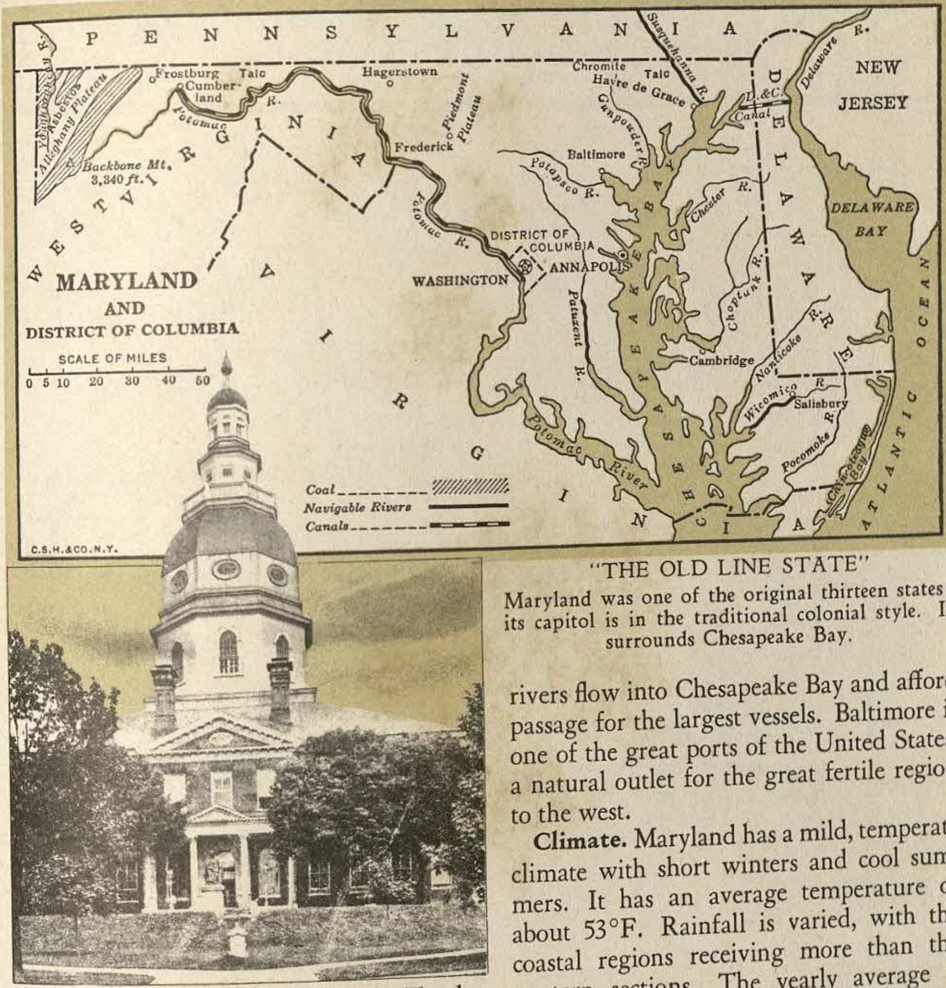


"THE OLD LINE STATE"
Maryland was one of the original thirteen states; its capitol is in the traditional colonial style. It surrounds Chesapeake Bay.

hilly, and noted for its rich soil. To the west the state grows narrower, so narrow, in fact, that at one point it is only two miles wide.

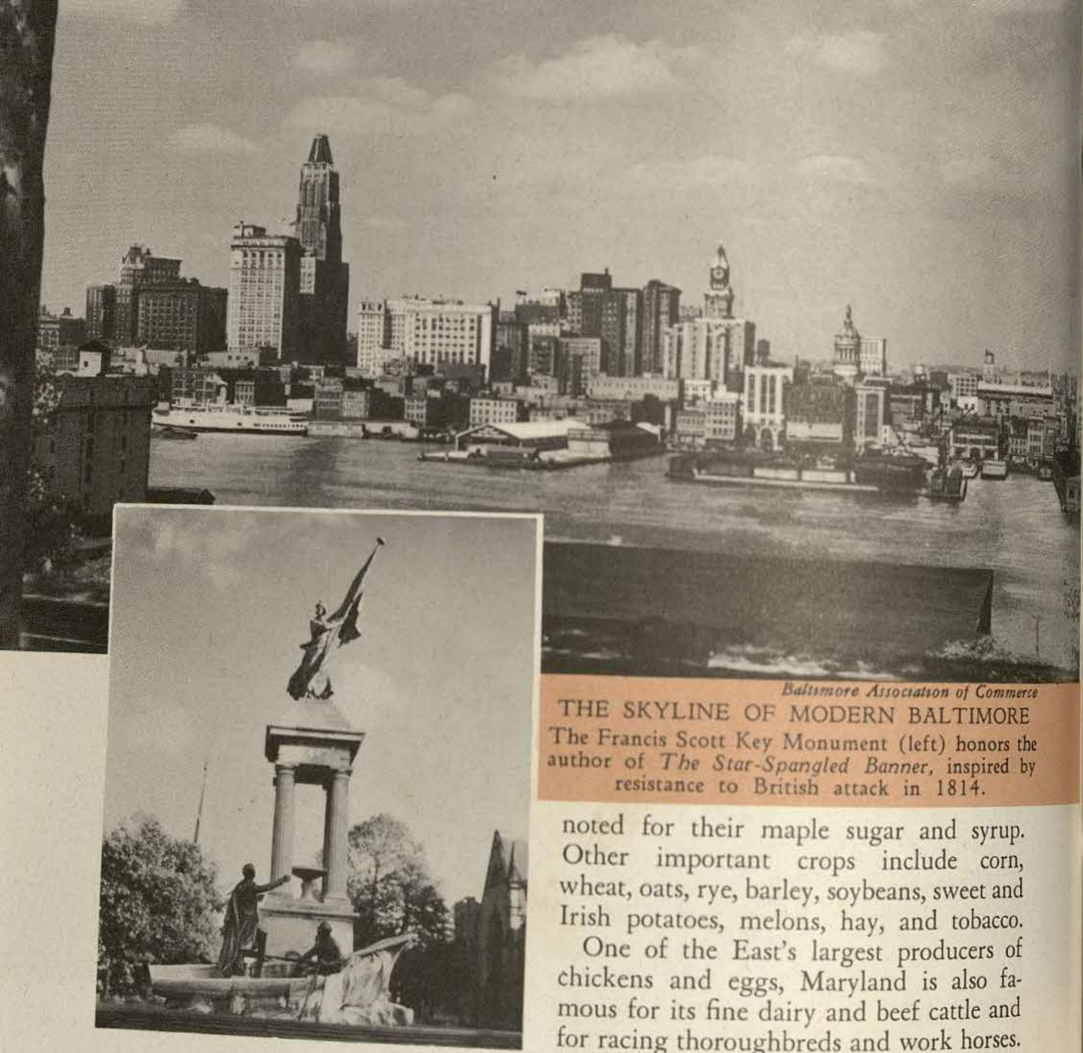
The Allegheny Mountains, part of the Appalachian system, and the Blue Ridge Mountains cut across this section. The forest-covered mountains are separated by wide, fertile valleys, which constitute important agricultural lands.

The largest river in the state is the Potomac, forming the southern and western borders. The Susquehanna flows southeast from the Pennsylvania to Chesapeake Bay. Other streams are small and navigable for only short distances. The coast of Eastern Maryland has few harbors, but several rivers flow into Chesapeake Bay and afford passage for the largest vessels. Baltimore is one of the great ports of the United States, a natural outlet for the great fertile region to the west.

Climate. Maryland has a mild, temperate climate with short winters and cool summers. It has an average temperature of about 53°F. Rainfall is varied, with the coastal regions receiving more than the western sections. The yearly average is about forty-two inches.

Natural Resources. Rich deposits of bituminous coal in the western sections constitute the chief mineral resources. They are a part of the great Appalachian coal field, which extends from Pennsylvania, across Maryland, and into West Virginia. Sand, gravel, and clay have a variety of industrial uses. Also important are limestone, granite, and marble. The state's other mineral resources include slate, cement, iron, and copper.

The state has extensive forests in the mountain regions, which are of great commercial value. Timber growing is profitable because of the large markets near by.



Baltimore Association of Commerce

THE SKYLINE OF MODERN BALTIMORE

The Francis Scott Key Monument (left) honors the author of *The Star-Spangled Banner,* inspired by resistance to British attack in 1814.

Chesapeake Bay yields large quantities of valuable food fish. Of greatest importance are the oyster beds which form the basis of one of the state's leading industries. The bay also supplies quantities of shad, clams, terrapin, and hard and soft crabs.

Farming. Maryland's mild climate, fertile soils, nearness to great markets, and fine transportation facilities combine to make it one of the East's leading agricultural states. "The Sho," as its Eastern Shore is called, is especially famous for its fruits and vegetables, the most important crops being strawberries, apples, and peaches. Great quantities of apples, peaches, and other fruits also come from western Maryland, whose mountainous areas are noted for their maple sugar and syrup. Other important crops include corn, wheat, oats, rye, barley, soybeans, sweet and Irish potatoes, melons, hay, and tobacco.

One of the East's largest producers of chickens and eggs, Maryland is also famous for its fine dairy and beef cattle and for racing thoroughbreds and work horses. Mules, hogs, sheep, and bees also are raised.

Manufactures. Baltimore, the leading industrial center, has several of America's largest shipyards and one of its greatest steel mills. Both Baltimore and Hagerstown also have giant airplane factories. The state not only leads the nation in tomato canning, but also freezes and cans vast quantities of other vegetables, fruits, and seafoods; slaughters and packs meat; refines sugar; and processes spices and extracts. Its other industrial products include railway equipment, tools, telephone cable, pipe organs, textiles, clothing, leather goods (including shoes), rubber tires, tin-plated containers, pottery, and chemicals.

Transportation. Chesapeake Bay provides many fine harbors and has enabled

Official U. S. Navy Photographs

ANNAPOLIS — ORIGIN OF ADMIRALS

From the Naval Academy at Annapolis, Md., come the officers who staff the United States Navy. Above, Stribling Walk leads to famous Bancroft Hall. At right, the color guard parades during graduation ceremonies.

Baltimore to be one of the nation's great seaports since colonial times. The Chesapeake and Delaware Canal, providing a short route to and from Philadelphia, is another busy waterway. The Baltimore & Ohio, the nation's first real railway and still one of its greatest, has its headquarters and principal shops in Baltimore. The state is served by domestic and foreign airlines. Friendship International Airport, halfway between Baltimore and Washington, is one of the world's great air centers. Mary-

United Press

MARYLAND'S HISTORIC CANAL

Artists try to capture the setting of Maryland's old Chesapeake and Ohio Canal. Tunnels and aqueducts make the canal a picturesque route.

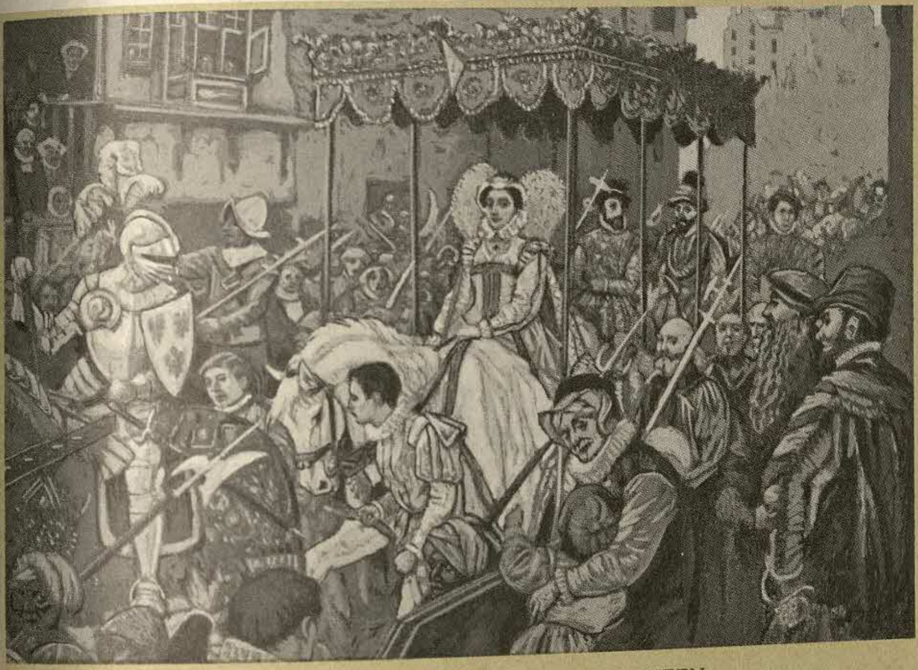
land has an excellent state-controlled highway system.

People and Government. Maryland has a population of about 3,104,000, ranking twenty-first in size among the states. About sixty-nine per cent of the people live in cities, of which Baltimore is the largest. Other leading cities are Cumberland, Hagerstown, and Annapolis, the capital.

The governor, attorney-general, and comptroller are elected for four years; the governor appoints the secretary of state for four years, while other officers serve two-year terms. The twenty-nine senate members and 123 members of the house of delegates serve four years. At the head of the judiciary branch is the court of appeals.

Education. In the last few decades, education in Maryland has made great strides; the illiteracy rate is now one of the lowest in the United States. The educational system is administered by a board of education and a superintendent. Each county has its own school commissioners, who appoint district trustees. Major institutions of higher learning include Johns Hopkins University, Goucher College for women, the College of Notre Dame of Maryland, Loyola College, and Morgan State College for Negroes, all in Baltimore. The leading state-supported institution is the University of Maryland. In Annapolis are the United States Naval Academy and St. John's College for men.

History. The first settlement in Maryland was established in 1634 by Lord Baltimore to provide a refuge for the persecuted Catholics of England. However, freedom of worship was allowed from the beginning. In the remaining years of the seventeenth century, numerous settlements were



THE TRIUMPH OF AN ILL-FATED QUEEN
In the year 1561, Mary Queen of Scots made her state entry into her capital, Edinburgh.

founded. All was not peaceful, however, for there was much friction between the colony and the traders of Virginia. There was also a long-standing boundary dispute between Maryland and Pennsylvania, which was finally settled by the establishment of Mason and Dixon's Line in 1767.

From the first, Maryland was one of the leading colonies in demanding freedom from English rule, and its people were active in the Revolutionary War. When it came to the founding of the new nation, Maryland demanded that the colonies claiming large territories in the West should give up their claims. It argued that they had a distinct advantage over those states that had no Western lands. For this reason, Maryland was the last state to accept the Articles of Confederation. It was, however, one of the first states to adopt the Constitution.

For the next fifty years Maryland carried on a program of internal improvements, such as the building of roads, canals, and railways. The state sided with the Union in the Civil War, although there were many slaves within its boundaries. In recent years Maryland has adopted many liberal and progressive laws.

MARY MAG'DALENE. See MAGDALENE, MARY.

MARY STUART (1542-1587). Mary Stuart, or Mary, Queen of Scots, met tragedy, disappointment, and violence at every turn of her eventful life. A beautiful, cultured, and educated woman, she endured a constant struggle against misfortune and the forces which sought to deprive her of her heritage—the crown of Scotland.

The daughter of James V of Scotland and his queen, Mary of Lorraine, or Guise, Mary Stuart succeeded to the throne when only a few days old, her father having died shortly after her birth. Her mother and the Earl of Arran ruled as regents for the child, who was sent to France to be educated. In 1558 Mary Stuart married the French dauphin, Francis II, and later became the queen of France; but Francis died shortly after his accession, and Mary

PEACEFUL MOMENT IN A TRAGIC CAREER

The secretary, Rizzio, shown entertaining his lady, Mary Stuart, was doomed to die at the hands of her enemies. Her husband was later murdered, and Mary herself was executed.

returned to Scotland to claim the throne.

She met great opposition, especially from John Knox, because of her Catholicism. In 1565 she married her cousin, Lord Darnley, to strengthen her position with the Scottish nobles. However, Darnley's weak and ignoble character soon won Mary's disfavor, which grew to complete alienation when Darnley was implicated in the murder of Rizzio, the queen's Italian secretary and friend. About this time Mary's son, the future James VI of Scotland, was born.

Shortly afterward Darnley withdrew from the court and the Earl of Bothwell rose high in Mary's favor. When Darnley was killed, both Bothwell and the queen were suspected of murder; and after Mary had married Bothwell, the anger of the Scotch lords knew no bounds. Taking up arms, the nobles set out against Bothwell and defeated him at Carberry Hill. Bothwell was forced to flee to Denmark, and Mary surrendered to her lords. Some time later, letters which seemed to implicate Mary in the murder of Darnley fell into the hands of the lords, who then forced Mary to renounce the throne in favor of her son. This son later became James I of England, since his mother was the rightful heir to the throne through her grandmother, Margaret of Tudor.

After a year in captivity, Mary made one more attempt to return to power, but was defeated. She appealed to Queen Elizabeth of England for protection. Elizabeth refused protection and, fearing Mary's power, made her a prisoner of England. Finally the Scottish queen was implicated in a plot against Elizabeth's life, and in 1587 she was condemned to death and beheaded.

MASARYK, *mah' sah reek,* THOMAS GARRIGUE (1850-1937). The son of a Moravian peasant, Thomas Masaryk led a movement to free the Czechs and Slovaks from Austria and became the real founder of the independent Czechoslovak Republic. A philosopher, author, university professor, and statesman when World War I started, he fled from Austria and worked in England

and the United States for Czechoslovakian independence. When Austria's defeat in that war resulted in the creation of the nation of his dreams, he became its extremely capable first President, serving from 1918 until he retired in 1935.

Jan Masaryk (1886-1948), son of Thomas, also became an outstanding Czech statesman. When Czechoslovakia became a Russian satellite after World War II, he was the country's Prime Minister. Whether he committed suicide or was murdered by the Communists remains a mystery. See BENES, EDUARD; CZECHOSLOVAKIA.

MASE'FIELD, JOHN (1875-). An English farm boy who ran away to sea, Masefield made many voyages, worked in a New York saloon and a Yonkers (N.Y.) carpet factory, and lived in London's slums before he became a writer. Using his experiences among people of the soil, sea, and slum, he sympathetically pictured their lives and tragedies, and became noted for the vigorous rhythm, emotional power, and lyrical beauty of his work. His poetry, including *Salt Water Ballads*, *The Everlasting Mercy*, *The Widow in the Bye Street*, *Dauber*, and *The Daffodil Fields*, brought him such recognition that he was England's Poet Laureate in 1930. Other works include *The Tragedy of Nan*, a play, and the novels *Margaret* and *Jim Davis.*

MASON AND DIXON'S LINE. A long-standing dispute over the Pennsylvania-Maryland boundary was settled by two English surveyors, Charles Mason and Jeremiah Dixon. Hired to make a boundary survey between 1763 and 1767, they followed a straight east-west line at north latitude 39° 43′ 26.3″ and marked it with milestones. Before the War between the States, this line, named after them, was considered the boundary between the free and the slave states. It is now the traditional dividing line between the North and South.

MA'SONRY, or FREEMASONRY. Believed to have grown out of the medieval craft guilds, Masonry is today the oldest, largest, and most influential secret organization in the world. It incorporates certain fundamental religious principles into the fraternal association and provides aid to members and their families in time of need. The members are called either *Free and Accepted Masons* or *Ancient Free and Accepted Masons.*

The Bible plays an important part in the ritual, and members must profess a belief in God, immortality of the soul, and the resurrection. Within the order there are numerous degrees, or steps, which a member may strive to attain. It is necessary, however, to attain only the third degree to become a Master Mason. All higher degrees are simply a continuation in the mysteries of the order.

In legend the origin of Masonry dates back to the builders of Solomon's Temple, but the history of the modern organization can be traced directly only to the sixteenth century. Before that time, there was a craft guild of masons and architects which had a ritual, password, and trade secrets. This guild had three branches of membership—apprentice, journeyman, and master mason—which correspond to the three levels of modern Masonry, but trade or profession play no part in membership today.

Masonic lodges throughout the world have a total membership of several millions, there being more lodges and more members in the United States than in any other country.

MASONRY, STONE. In a broad sense, masonry includes not only stone masonry but also brick masonry, tile masonry, and concrete masonry. Stone masonry is, of course, the oldest. It dates back to ancient days when the Egyptians piled massive blocks of stone one upon another to form the world-famous pyramids, an engineering feat that is still a mystery to us. The Temple of the Sun at Baalbek, Syria, is said to be so perfectly cemented together that its joints cannot be seen.

Thus, even in the olden days, masonry was as accurate an art as it is today. Early masons wrought massively; today designers in masonry attempt to replace some of the vast, ponderous construction with the more ornamental effects not possible in ancient times.

Stone blocks for building purposes are usually completely prepared at the quarry, and no work is done on them at the building site. The mason who lays these great blocks is assisted by helpers, hod carriers, and mixers, although the actual mixing of the mortar is now done largely by machinery.

Types of Stone Masonry. There are three general types of stone masonry. One of the best known is *random rubble,* rustic in appearance and rough on the surface. The stones are irregular in size and shape, and all odd corners and small gaps are plugged with smaller stones and the whole held together with mortar. *Squared* rubble is made up of finished blocks of various sizes, so fitted and held together with mortar that a square, smooth-surfaced wall results. Another type is *ashlar masonry,* which may be either smooth or rough-faced. At all points where the blocks fit together, they are carefully smoothed. In ashlar masonry, the blocks are usually from two to three times longer than they are high. See BRICK AND BRICKLAYING; CONCRETE.

MASQUE, or MASK. A brilliant dramatic entertainment, coupled with dancing and music, the masque was much enjoyed in the European courts of the sixteenth and seventeenth centuries, particularly in England. The earliest masques consisted of an arranged program of music, dancing, and banqueting; the first entertainment of this kind in England was performed in the early part of the sixteenth century, according to Holinshed's *Chronicles.* Later masques became elaborate and spectacular, and the parts in these entertainments were often taken by the leading personages at the court.

The masque also became an important part of the literature of the period, being introduced into the plays of Shakespeare and of Beaumont and Fletcher. Ben Jonson wrote many fine, poetic masques, and Milton's *Comus* is one of the best.

MASS. The ceremonies which accompany the offering of the Eucharist, or Holy Communion, in the Roman Catholic Church are collectively called the mass. The complete service consists of four parts: the introduction, the offertory or sacrifice, the consecration, and the communion. Each division in turn consists of prayers, hymns, Biblical passages, and a number of special ceremonies.

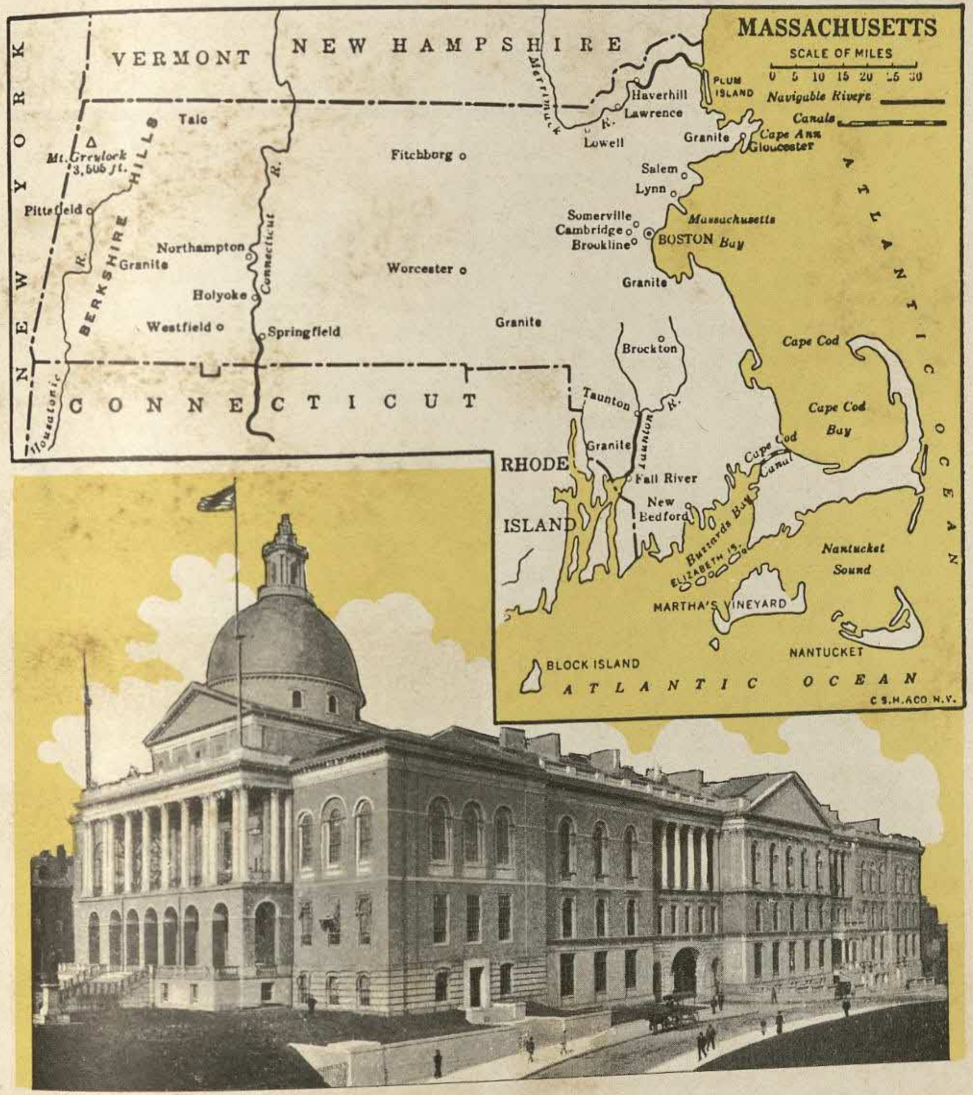
The basis of the mass is the re-enactment of the martyrdom of Jesus and the presentation of the bread and wine which, in Catholic doctrine, have been miraculously converted into the substance of Jesus' body and blood. The mass may be said only by a priest, and there are definite rules concerning when he may say it, such as that requiring him to fast from the midnight preceding the recitation.

Massachusetts Development and Industrial Commission

BAY STATE PATRIOTS' SHRINE

Massachusetts Minuteman; the Lexington statue.

MASSACHUSETTS, *mas a chu'sets.* Truly the cradle of American liberty is Massachusetts, "the Bay State," for here it was that the early colonists began their quest for freedom of worship and government. Of all the Northern states in the Union no other is so closely connected with the early history of the nation as is



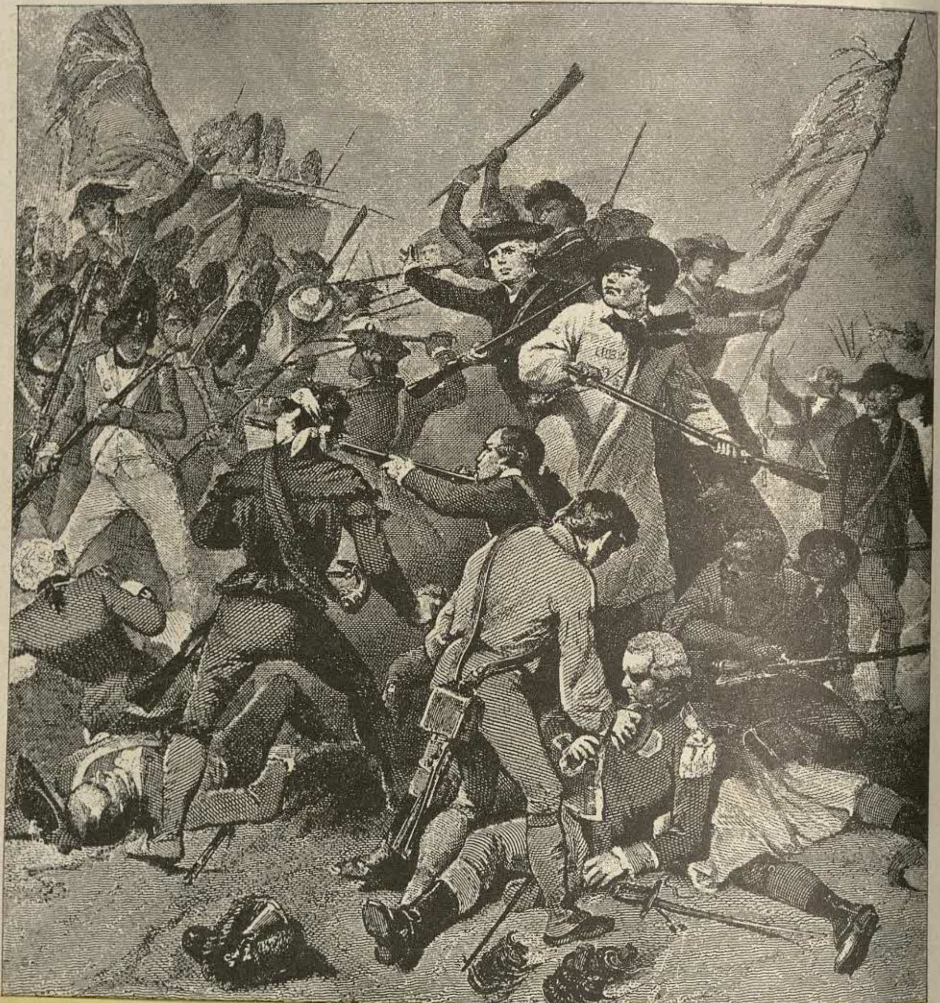
CRADLE OF AMERICAN HISTORY

Massachusetts, "the Old Colony State," has an historic tradition unsurpassed in America.

this New England state. From the first Pilgrim settlement in 1620, it has grown with the nation until now it is one of the most densely populated states as well as one of the outstanding industrial centers in the country. The state, too, has great natural beauty in its wooded mountains, varied seashore, inland lakes, and winding rivers.

The shape of the state is oblong, except for the irregular eastern end with the long arm of Cape Cod and numerous bays and indentations. The irregular coast line is about 250 miles long and offers many excellent harbors for ocean vessels. The state covers an area of 8,257 square miles and ranks forty-fifth in size among the states of the Union.

Surface Features. Massachusetts does not have clearly defined surface features, although there are six irregular sections. The eastern part of the state is separated



THE FIRST GREAT VICTORY IN THE WAR FOR INDEPENDENCE
The Americans held Bunker Hill until they ran out of ammunition, and then they were forced to retreat. But the battle cost the British the lives of a thousand men; encouraged the colonists.

from the western by the Connecticut River, which crosses the state from north to south about 100 miles from the coast. West of the river are the Berkshire Hills, two ranges of mountains crossing the state from north to south and forming a series of ridges cut by sharp ravines and narrow, fertile valleys. In the extreme west, between the Berkshire and Taconic ranges, is the Housatonic Valley, in which the land is gently rolling but rising to sharp ridges.

East of the Connecticut Valley are the Central Highlands, high, broad hills that rise from 500 to 1,200 feet above sea level. The highlands merge in the northeastern part with the Eastern Slope, a region of low hills sloping down to the sea. South of this area is the coastal region of broad, low hills and ridges.

There are few navigable rivers, and these can be used only by small boats. However, many of them are fast-flowing streams that furnish valuable water power. The largest and most important river is the Connecticut. Others are the Merrimack, the Taunton, the Housatonic, the Charles, the Deerfield, and the Westfield. One of the most valuable water routes is the Cape Cod Canal (See CAPE COD CANAL). There are also many small lakes and ponds scattered throughout the state.

MASSACHUSETTS REBELS AGAINST REGAL INJUSTICE
The Boston Tea Party (left) was a protest against an outrageous tax measure. But the Boston Massacre (right) was one of the incidents which precipitated actual war.

Climate. The winters are often very cold and the summers vary from temperate to hot. The coastal area, tempered by the sea, is milder in winter and cooler in summer than is the interior. The average yearly rainfall is over forty inches.

Natural Resources. The state's mineral resources consist chiefly of clay, lime, silica, sand, gravel, slate, and stone, especially granite, basalt, and marble. There is, however, practically no metal mining in Massachusetts today, although some iron, copper, lead, gold, silver, and other ores have been produced at times.

Fishing has long been an important industry along the coast, and Massachusetts is one of the country's leading producers of fish and fish products. In addition to the off-coast fisheries the Grand Banks of Newfoundland provide a valuable catch for fishermen of the state. Boston is the leading market for fresh fish in the United States. Gloucester cures more fish than does any other city, and is the center of the cod industry (see COD). Provincetown too, is an important fishing center, and New Bedford and Nantucket Island were once world-famous whaling stations, sending ships to the far corners of the earth.

Farming. Specializing in producing foodstuffs for its city markets has made Massachusetts farming more profitable than it was in early days. Today the state's agricultural income is derived chiefly from poultry, dairy products, truck crops, tobacco, meat animals, fruits, potatoes, and cranberries; in the production of cranberries it leads the nation.

Manufacturing and Commerce. Massachusetts has always been one of the leading industrial states, chiefly because it has an abundance of power and excellent transportation and shipping facilities. The industrial centers are well distributed, the largest number being situated on rivers

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ESSENCE OF NEW ENGLAND

Left a "saltbox" house with its roof reaching nearly to the ground in back, remains in Massachusetts to testify to 18th century architectural style. Right, fish for seafood dinners are weighed at Gloucester.

that produce water power. The leading products are boots and shoes, woolen and worsted goods, and cotton goods. Other important industries are printing and publishing, dyeing, and the manufacture of machinery, electrical equipment, watches, leather, paper and wood pulp, foundry products, meat products, silk goods, and furniture. Manufacturing cities include Boston, Lawrence, Brockton, Haverhill, Lynn, Fall River, Lowell, New Bedford, Worcester, Springfield, and Waltham.

Because of its great production of manufactured goods and its excellent harbors, Massachusetts has an extensive foreign commerce. Boston is the chief seaport of the state as well as of New England as a whole. It exports machine tools, meat, cotton and wool products, fish, and grain. Imports include hides, wool, and fibers. Steam and electric railways in Massachusetts total more than two thousand miles. There is an excellent highway system in the state.

The People and Their Institutions. Only about fifteen per cent of the people live in rural areas; the rest live in urban areas. About one fifth of the people are foreign-born, with Canadians, Irish, Italians, and English most numerous. Massachusetts has a population of about 5,171,000, or about 626.3 persons per square mile. Only Rhode Island and New Jersey are more densely populated states.

The state has contributed more than its share of leaders in the national life. Particularly outstanding are its literary figures, such as Bryant, Lowell, Holmes, Thoreau, Emerson, and Whittier. Leaders in public life have included members of the Adams family which gave the nation two Presidents, John Adams, and John Quincy Adams. Calvin Coolidge, the thirtieth President, spent most of his life in Massachusetts and was governor of the state for two years.

Massachusetts is a leader in education, its educational system being the oldest in the United States. The first school was established in 1635, and the first college, Harvard, was founded the next year. The educational system is administered by a commissioner of education who is the head

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LANDING PLACE OF THE PILGRIMS

Descendants of the Pilgrims who landed here at Plymouth Rock in Massachusetts pay a Thanksgiving Day tribute to their courageous ancestors.

of a state board (see MANN, HORACE). Maintained by the state are a number of trade schools and teacher-training colleges, as well as Massachusetts State University, located at Amherst. Massachusetts is widely known for its privately endowed institutions of higher education, which include Harvard University, Amherst College, Williams College, Clark University, Massachusetts Institute of Technology, Holy Cross College, and Tufts College. Perkins Institution for the Blind, in Boston, is one of the most famous schools of its kind. Outstanding women's colleges are Mount Holyoke, Radcliffe, Smith, Wellesley, Wheaton, and Simmons.

Local government begins with the township, whose officers are elected at town meetings. The legislative branch of the state government is called the General Court of the Commonwealth of Massachusetts; it consists of a senate of forty members and a house of representatives of 240 members. Members of both houses and the governor and other state officers are elected for two-year terms. At the head of the judiciary branch is a supreme court composed of seven justices.

The largest city in Massachusetts is Boston, the capital; other large cities are Worcester, Springfield, Fall River, Cambridge, New Bedford, and Somerville.

History. It is thought that the Norsemen visited the shores of Massachusetts about the year 1000 (see ERICSON, LEIF). It is certain that Gosnold explored the coast in 1602 and John Smith in 1614. The first permanent settlement, however, did not come until 1620, when the Pilgrims founded their colony at Plymouth. They were an intensely religious people who for many years had been seeking a home where they could have freedom of worship. A few years later a group of Puritans founded a colony at Salem. Other settlements were soon founded, and all were later combined in the Massachusetts Bay Colony.

From the very first the colony had a strong government, largely dominated by the Church. In fact, the Church and the

United Air Lines

SIGNAL LANTERNS HUNG IN THIS HISTORIC TOWER

Lanterns hung in the belfry of Boston's Old North Church (above) sent Paul Revere riding through the countryside to warn the patriot soldiers of the approach of British troops.

government were practically one and the same thing. Little freedom was allowed those who did not believe as the leaders of the colony did; because of this, many people were banished. The most noted were Roger Williams and Anne Hutchinson.

The settlements were frequently attacked by Indians, and many were destroyed. Plymouth Colony and the Province of Maine were united with the Massachusetts Bay Colony under one charter in 1692. This charter provided for a less liberal government, and a royal governor, appointed by the king, was sent to the colony. The famous Salem witch trials marked the climax of religious intolerance in Massachusetts, and thereafter the colony became more liberal.

Up to the time of the Revolutionary War, Massachusetts developed rapidly in wealth and influence. The colony, however, had numerous conflicts with the Indians and the French. It was one of the first colonies to feel the effects of the Industrial Revolution in England. Many factories were established for the production of shoes, iron products, hats, and textile goods.

After 1763 the industrial and commercial advancement of Massachusetts was impeded by England's colonial policy. For this reason, the movement for breaking away from the Mother Country began here. The colony contributed not only ideas to the Revolutionary cause, but also such leaders as John Hancock, Samuel Adams, and James Otis. Outstanding events of the Revolutionary War occurred in Massachusetts, such as the Boston Tea Party, the Boston Massacre, and the battles of Lexington, Concord, and Bunker Hill.

In 1780 a state constitution was adopted. The depression that followed the Revolution led to Shay's Rebellion in 1786. However, the various industries regained their prosperity, and the state entered upon a period of progress. Massachusetts was one of the first states to ratify the Federal Constitution. When Massachusetts adopted its constitution, it outlawed slavery; and, as a result, it was one of the leaders of the anti-slavery movement leading up to the Civil War. Since the Civil War, Massachusetts has been a leader in education, industry, and commerce. See BOSTON; LITERATURE; REVOLUTIONARY WAR IN AMERICA.

MASSACHUSETTS BAY COLONY. Self-government in America had its beginnings in the Massachusetts Bay Colony, founded on the site of Salem in 1628. In that year a group of sixty Puritans, led by John Endicott, crossed the Atlantic to found a colony that was to be plagued with disease, dissension, and mismanagement. Two years later the charter for the colony was sent to Salem, thus giving the settlers a form of constitution for self-government.

Religious persecution in the colony resulted in the founding of settlements in Rhode Island and Connecticut. Harvard College was founded by the colony, which also set up North America's first printing press. See ENDICOTT, JOHN.

MAS'TIFF. One of the largest and most famous of dogs, the mastiff comes from a long line of working dogs. A full-grown mastiff should weigh about 170 pounds and stand twenty-eight inches high at the shoulder. It may be either brindle or fawn-colored, with a dark face. The animal should be solidly built and have strong, straight legs and body. Its head should be massive and it should be deep-chested. A sagging back, rolling gait, and undershot head are all points of inferiority.

Many instances have been cited of the bravery of mastiffs and of their devotion to their masters. In the early days they were used in hunting game and in fighting with neighboring tribes. The breed has been distinct since before the beginning of the Christian Era. It is probable that the great Danes have been derived in part from the mastiff.

HOME POLICE FORCE
Mastiffs make remarkably good watchdogs.

MAS'TODON. Roaming the earth thousands of years ago was the mastodon, a prehistoric member of the elephant family. It has been extinct since shortly after the close of the Ice Age. Massively built and having a covering of shaggy hair and two large curved tusks, the mastodon gradually attained the size of the larger elephants of today. Originally feeding on roots and bulbs, the animal later became a grass eater, developing cross ridges on the teeth for chewing grass; the lower lip grew into a long, snoutlike projection, or proboscis.

Fossil bones and teeth of the mastodon have been discovered in all the continents except Australia. The earliest mastodons, however, are thought to have lived in Africa, from where they spread to Europe and Asia. The animals also lived in America, having crossed the ancient Asia-North America land bridge. See ELEPHANT; GEOLOGY.

MATCHES. Considering the centuries during which man has used fire, plentiful common matches are a comparatively new convenience. They are just splinters of wood, pressed paper, or wax, tipped with chemicals which take fire by friction, but they save many an extra chore.

Before matches were invented, most households were supplied with tinder boxes. A tinder box contained the flint and steel needed for producing a spark, with a tinder of some vegetable matter to catch the spark, which was then blown into a flame. On top of the tinder box, a candle end was usually placed to use in carrying the new light. It was often a very slow process to obtain a light with this device, which meant that it was sometimes more convenient, and a great saving of time, to go to a neighbor's and get red coals that could be used in kindling a fire.

An improvement over the first type of tinder box was one by which sparks were obtained by spinning a steel wheel with a piece of cord, making the wheel strike a flint fixed in the side of a little trough full of tinder.

Later, strips of wood were dipped in sulphur and could be used in carrying a flame from the fire to a candle.

In 1805, chemical matches were made, which consisted of strips of wood tipped with a chemical composition. They were fired by touching the tip to concentrated sulphuric acid carried separately in a bottle, which, when needed, was soaked up in asbestos.

Modern Matches. The first friction matches (those lighted by rubbing across a surface) were invented by John Walker, an Englishman, in 1827. The first successful matches tipped with phosphorus were patented in the United States by A. D. Phillips in 1836. Modern matches are made of wood, tipped with an igniting composition, the portion of the wood near the head being coated with paraffin or stearin to aid in igniting the wood.

The chief match-producing countries are the United States, Norway, Sweden, and Japan.

Safety matches are matches so made that they will not light except when rubbed over an especially prepared surface placed on the box containing them. *Book* matches are safety matches made with flat cardboard stems, two layers of which are joined together at the base and bound in a cardboard cover, on which is the special striking surface. *Double-tip* matches have larger heads, made in a different way from the usual method, and are not combustible on simple friction.

MATHEMAT'ICS. We marvel at the size and beauty of such modern wonders as the San Francisco-Oakland Bay Bridge or a city skyscraper. More marvelous, however, is the fact that we cross such a bridge or work high up in such a building with absolutely no doubt as to its strength and safety. We realize that higher mathematics was involved in the engineering of such structures, and we are confident that the principles applied to their construction are as basically true as $2 + 2 = 4$. This serene confidence is man's greatest tribute to the subject of mathematics.

A pure definition of mathematics is likely to be more confusing than no definition at all. Suffice it to say, then, that mathematics is the basis of much exact thinking and knowledge. It deals with numbers, magnitudes, and quantities; nothing is more basic than these things. It may be the groundwork of the physical sciences (chemistry, physics, and astronomy), but it supports biology, too. Why does each cell in a honeycomb have six sides? In what other subject could Mendel's Law of Heredity be explained? Mathematics is truly the exact science. It must be exact, for it can lean on nothing for support; it supports everything else; its structure can admit of no flaws.

The Structure Dissected. All mathematics may be divided into two types, *pure* and *applied*. The difference between the types is easily explained—the pure shows why the applied will work. The pure will prove that, at any given moment on a sunny day, the height of every object and the length of its shadow are in exactly the same ratio. The rule applied will permit you to compute easily the height of the tree outside your house.

Today, applied mathematics is becoming

increasingly more important than its parent, pure mathematics. The reason is that new contributions by scholars of the pure form are becoming less and less frequent, the structure being pretty nearly complete; on the other hand, new applications of old principles are only now being given the attention they might have had for the past 200 years. The result has been the continual new discoveries in electricity, heat, light, and sound, mechanics, surveying and geodesy, navigation, and astronomy.

The study of pure mathematics falls into three general divisions. They are *algebra* and *arithmetic,* which deal with the qualities and relations of numbers, and computations by means of them; *analysis,* which has calculus as its base; and *geometry,* covering the description, properties, and measurement of lines, angles, curves, surfaces, and solids. Only the elements of each division are offered in the curricula of elementary and secondary schools.

History. History of mathematics is significant in that it reflects the relative intellectual curiosity of each age. Let us indicate the general trend by saying that the fresh substance of mathematics was first sampled by the ancient Egyptians, Phoenicians, and Babylonians and later consumed eagerly by the Greeks and Hindus. Each of these peoples worked differently—the Greeks with geometry, the Hindus with numbers and notation; but each exhausted his materials with amazing thoroughness.

The coming of Christianity and its accompanying mysticism deadened the taste for mathematics until the sixteenth century, when such men as Copernicus and Tartaglia again investigated the subject. In the next century came Descartes, Kepler, and Pascal. All these men, together with Leibnitz and Newton a little later, devised new uses for the findings of the Greeks and Hindus, the result of their labor being the invention of analytic geometry and calculus. Since then mathematics has advanced by leaps and bounds, and new results are continually being brought to light. The opportunities that have been granted to scientific investigators since the eighteenth century by the workable truths of mathematics are increasing daily.

For additional information, consult the following titles:

Algebra
Archimedes
Arithmetic
Calculus
Euclid
Geometry
Kepler, Johann
Logarithm
Measurements
Newton, Sir Isaac
Plato
Pythagoras
Trigonometry

MAT′TER. It would be simple to say that matter is the substance of which the earth and all the things we see upon it are composed. But the more learned scientists become, the more cautious they are in judging the nature of matter; they say merely that matter is the substance of which material objects are *thought to be composed.*

Properties of Matter. Some things would seem to be true about matter, as it presents itself to our organs of sense. First of all, it occupies space. Secondly, one particle of matter cannot occupy the space filled at the same time by another particle. In the language of physics, these properties are called *extension* and *impenetrability.* Matter also has *inertia;* that is, it resists any attempt to change its state of rest or motion, as we see from the facts that it takes more power to start an automobile than to keep it moving, and that we use brakes to stop its motion. See INERTIA.

A definite portion of matter is called a *body.* The particles of matter contained in any body sometimes tend to stay together and sometimes to unite with the matter of other bodies which touch them. Thus, a piece of wood holds itself together (cohesion), and glue clings to wood (adhesion).

Although all matter is presumed to be fundamentally alike, particles of matter may unite into differing groups called *substances,* each substance having distinct properties. Some of these properties are *hardness,* illustrated by the diamond, which will scratch any other substance; *brittleness,* found in glass, which breaks easily; *tenacity,* possessed by a fiber of cotton, which

MONARCH OF THE ALPS
atterhorn's tall whiteness dwarfs city of Zermatt.

cannot be pulled apart by a force of a million times its own weight; *porosity,* or the possession of open spaces between the particles of matter, exemplified by sandy soil; and *compressibility,* or the ability to be pressed together so that these open spaces are partly filled, a property possessed by air.

The ability which some iron has to be hammered, that which gold has to be pressed, or drawn into wires, and that of rubber to recover its shape after pressure, are described in the articles Malleability; Ductility; Elasticity. See, also, Viscosity; Friction.

States of Matter. Ice, water, and steam are three states of the same substance. The first is a *solid,* the second a *liquid,* the third a *gas.* Air, which is normally a gas, may become a liquid or a solid under certain conditions of temperature and pressure; iron, ordinarily a solid, may become a liquid or a gas. In general, the characteristic of matter in a solid state is that it has shape and size; of matter in a liquid state that it has size, but no shape of its own; of matter in a gaseous state that it has neither size nor shape of its own. But the boundary line between any two states cannot be sharply defined. See Gas; Liquid.

MAT'TERHORN, or MONT CER'VIN. Rising 14,780 feet above sea level in the form of a huge horn, the Matterhorn is located in the Pennine Alps on the boundary between the Swiss canton of Valais and Italy. Although the peak is covered with dangerous glaciers and is almost vertical on the northern side, it has been ascended many times. The first ascent was made in 1865 by a party led by Edward Whymper, British mountain climber.

MATTHEW, *math'u,* Saint. An evangelist and one of the apostles of Christ, Saint Matthew, the son of Alpheus, was a Roman tax collector before his call to the service of Jesus. There is only one mention of Matthew after Christ's ascension, but tradition states that he spent fifteen years preaching in Jerusalem, Ethiopia, Macedonia, Syria, and Persia, where he suffered martyrdom. The first of the gospels bears his name. See Gospels.

MAURITANIA, Islamic Rebublic of, is a nation formed from French West Africa. It lies on the Atlantic Ocean, and is bounded by Spanish Sahara, Algeria, Sudanese Republic, and Senegal.

It became independent November 28, 1960. Its area is 415,900 square miles, and has a population of about 624,000. Its capital is Nouakchott. It has been self-governing since 1958.

MAURITIUS, *maw rish' e us,* is a British possession in the Indian Ocean, 550 miles east of Madagascar. It has an area of 720 square miles. It is a rich tropical island with jagged mountains and fertile valleys. Principal crops are sugar, rice, maize, cotton, and coffee. It has a population of about 605,000. The capital is Port Louis. Mauritius was discovered by the Portuguese in 1505. In 1810, it became British.

MAXIMIL'IAN (1832-1867). A brother of Emperor Francis Joseph of Austria, Maximilian was persuaded by Napoleon III and a group of Mexican notables to take the throne of Mexico in 1864. Becoming involved in serious financial and political difficulties, he decided to abdicate, but was induced by the Conservative party to stay. The United States protested the presence of French troops in Mexico; and after the troops had been withdrawn, the populace revolted. Maximilian and his two chief generals were captured and executed.

MAYAN CERES
This bust of the maize god of the Mayan civilization was once part of a temple.

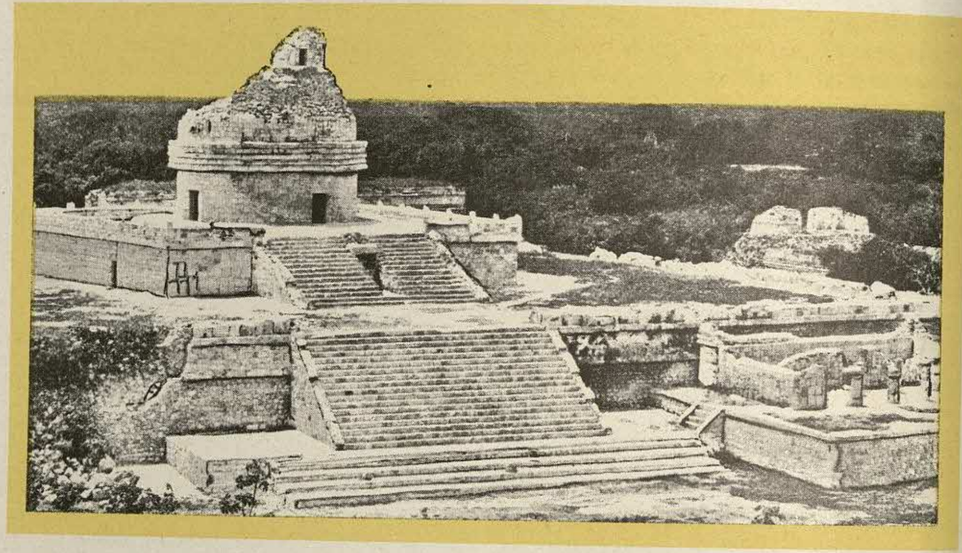
MAY. Fragrant flowers and sunny days characterize the "merry month of May," the fifth month of our year and the third of the ancient Roman year. The joyous beauty of the month is typified in the festivals of May Day, celebrated now, as in ancient days, with flowers and gaiety. The Romans held such celebrations in honor of Flora, goddess of the flowers, and from these the English festivals were derived.

The origin of the name, May, is not definitely known, but some think that the name comes from *Maia,* Roman goddess of spring; others say that the term comes from the Latin *maiores,* meaning older men.

An important holiday in the United States is Memorial Day on May 30, when special services are held in honor of the American war dead.

MAYA, *mah'yah.* Deep in the Central American jungles lie the remains of splendid temples and palaces, jade-studded statues of animals and men, pottery of exquisite design and shape, and walls and tablets emblazoned with curious, mysterious hieroglyphics. They are the remnants of the most advanced of all American Indians—the Mayas.

Their Story. Records left by these civilized Indians indicate that they inhabited what is now Yucatan, Guatemala, British Honduras, and other Central American countries as long ago as 613 B. C. From that time until A. D. 176, the Mayan civilization advanced rapidly, as wood carving, picture writing, and a calendar show. From 176 until 629, the Mayas were at the height of their power and culture under a regime known as the First Empire. They estab-



STRANGEST OF MAYAN TEMPLES—THE CARACOL

The name is Spanish for *snail* and refers to the spiral stairway in the round tower.

lished colonies, built cities, constructed magnificent temples atop pyramids, carved ornate figures from jade and other stones, and adorned their buildings with designs in low relief.

Why the First Empire came to an end is not known, but, apparently, a period of decline followed for the next 300 years. In 964, however, the Second Empire came into being, and from 1000 to 1200 there occurred a renaissance in art and culture. This change was posibly due to the influence of a great hero, Quetzalcoatl, who was revered as a god. The end of the Second Empire in 1437 was the end of the Mayan civilization. Civil war, disease, and migration probably were the causes of the decline preceding the Spanish conquest. Descendants of the Mayas are intermingled with other people of Central America today, but they have lost their identification with the great civilization of the past.

Their Civilization. The civilization of the Mayas, like all others, was founded in the soil. Agriculture was the chief industry, and the basis of religion. Maize, or corn, was the principal crop; and since this crop was subject to the vagaries of natural forces and animals, it was logical that animals and natural forces should be the chief deities. To worship these gods, temples, built of rock and faced with limestone, were constructed and decorated with images of the gods. The temples were placed on pyramids and were grouped in plazas.

The Mayan calendar, remarkably accurate; the Mayan sports (one game was similar to basket ball and was played with a rubber ball); and all art were based on religion. The pottery was excelled only by that of the Incas of South America, and the statues were the finest in the Americas. The Mayas excelled in mathematics and were capable of predicting eclipses and other astronomical phenomena. Cloth was woven from cotton. Musical instruments for the accompaniment to dances were known.

The hieroglyphics have been partially deciphered by scientists, but there are still many things concerning these people that the world has yet to learn. This form of writing seems inferior to that of the Egyptians, containing fewer symbols for ideas, and more pictures. From it, however, we learn that the Mayas kept slaves; waged war with spears and bows and arrows; and attempted to take prisoners, rather than to kill their enemies, in order to offer them as sacrifices or to make them slaves. We also learn that both men and women tattooed their bodies, and that trade flourished. But just how great their trade was is not known. Undoubtedly the Mayas made contributions to modern civilization, some of which will be found listed in the article INDIANS, AMERICAN.

BY THE MASTER BUILDERS
Mayan buildings often included elaborate sculptures of gods. These are rain deities.

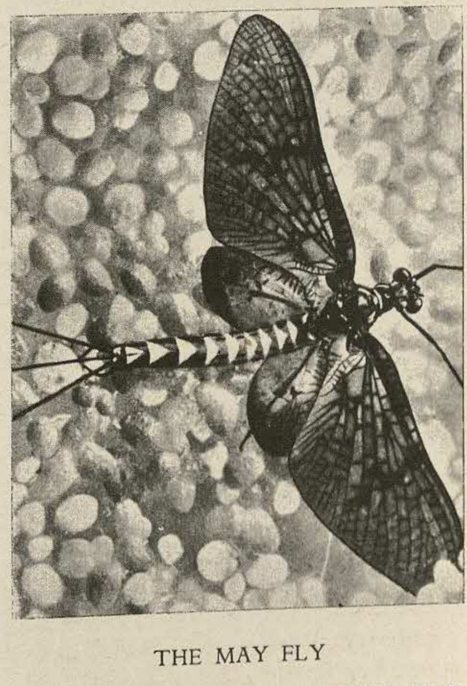
Although men have studied the Mayan civilization for many years, the greatest impetus was given in 1929 when Charles A. Lindbergh flew over Central America and sighted a previously undiscovered temple. This discovery, later verified by an expedition, created considerable interest in the Mayas, and numerous expeditions have been sent to Central America to unearth more temples, sculpture, pottery, and other evidences of the outstanding civilization of early America. See ARCHAEOLOGY.

MAY APPLE. Another name for this plant, which belongs to the barberry family is *mandrake*. Its root is used in making a powerful drug. See MANDRAKE.

MAY'FLOWER. Among the sailing vessels which have made history must be included the *Mayflower*. Weighing only 180 tons, it carried 102 passengers to the New World in 1620. It started out from Southampton, England, in company with the *Speedwell,* which had come from Holland. But the *Speedwell* proved unseaworthy, and both vessels turned back. The *Mayflower* then sailed alone from Plymouth. After a two-month voyage, the ship reached America; and on December 21, according to the modern calendar, the Pilgrims landed at Plymouth to found the first permanent settlement in New England. Before landing, the forty-one heads of families aboard signed the famous "Mayflower Compact," an agreement for governing the colony. A replica of the *Mayflower* sailed to the United States in 1957.

For additional information, see:

Massachusetts	Plymouth Colony
Pilgrims	Plymouth Company



THE MAY FLY

MAY FLY, DAY FLY, or SHAD FLY. The popular belief that this delicate insect lives for only one day is approximately true, and gives it its scientific name, *Ephe-*

meridae. May flies have rather slender bodies, with two or three long, delicate tails on the tip of the body. The wings are thin and finely netted, the front pair being much larger than the hind ones. In some forms the latter are lacking. The wings do not fold. The flies develop from grublike nymphs, which live in water on the bottoms of ponds, lakes and streams.

The nymphs are so numerous that they form the chief item of food for many fishes. In the daytime they may be found hanging, back downward, from twigs on shrubs and trees near the water. At night they are attracted to lights, sometimes in incredible numbers.

MAYO, Charles Horace (1865-1939), and William James (1861-1939). Two of America's most famous surgeons were Charles and William Mayo, whose clinic at Rochester, Minn., has become a world-renowned health center. William was born at Le Sueur, Minn., and Charles at Rochester; both were educated in the schools of the latter city. In 1889, after William's graduation from the University of Michigan's medical school and Charles's from the Chicago Medical College, the two brothers joined the staff of Saint Mary's Hospital in Rochester. Their reputation as surgeons grew rapidly and professional men came from all over the world to observe their amazing technique. In 1915 the Mayo brothers presented to the University of Minnesota their surgical laboratory, with an endowment of $1,500,000.

MAY'OR. The chief executive of most cities and towns in English-speaking countries is the mayor. He is usually elected by the people; and, in the United States, he serves from one to four years. He is charged with enforcing local ordinances and recommending measures to the board of commissioners or board of aldermen. In France the mayor is called *maire;* in Germany, *burgomaster;* in Scotland, *provost.*

In English and French cities, the mayor receives little or no salary, the position being considered an honor. And sometimes the mayor holds office for life. In the United States, mayors are sometimes paid large salaries, depending upon the size of the city. See City; City Manager; Commission Form of Government.

MAZARIN, *maz a raN',* Jules (1602-1661). Although an Italian by birth, Mazarin became one of the most powerful men in France during the seventeenth century. He was first sent to France as a diplomatic representative of the Pope and, while there, gained considerable favor with Cardinal Richelieu, the minister of state. He became a naturalized French citizen in 1639, and two years later was made a cardinal. When Richelieu died, in 1642, Mazarin succeeded him as minister.

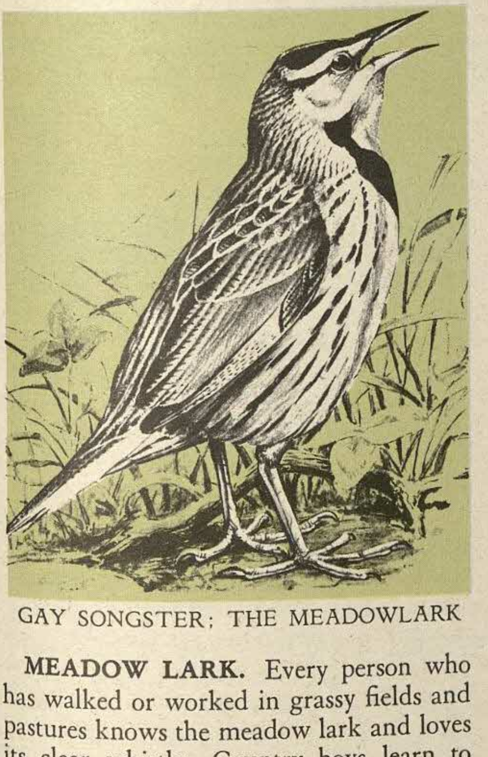
The ambitious Mazarin won the confidence of the queen and, when Louis XIII died, became the most influential person in the kingdom. He was denounced for his high taxes and was hated by all classes. Thus the civil war of the Fronde was brought about. Mazarin was forced into exile; but after his return in 1653, he regained his power and paved the way for the absolute rule of Louis XIV.

MAZZINI, *mat se'ne,* Giuseppe (1805-1872). This Italian patriot organized the Society of Young Italy and aided Garibaldi in the struggle for Italian liberty. Because he was a liberal thinker, many of his early works were suppressed. Having engaged in the uprisings caused by the Carbonari, he was imprisoned for a short time in Savona and later exiled to France. The French government was none too friendly, and Mazzini was forced to go to Switzerland. His revolutionary activities finally caused the Swiss to expel him, and he then sought refuge in London.

During the revolution of 1848, Mazzini joined Garibaldi in Italy and was appointed a triumvir under the temporary republic. Although elected to the Italian Parliament after it was established, the democratic patriot refused to support the monarchy and so declined the honor. See Italy.

MEADE, *meed,* George Gordon (1815-1872). Victorious in the Battle of Gettysburg, General George G. Meade had an important share in the events that marked the turning of the tide in favor of the North in 1863. Born of American parents living in Cadiz, Spain, Meade graduated from West Point, served in the Seminole War, and later became a government surveyor. He took part in the Mexican War and was a captain at the time the Civil War began.

After becoming brigadier general of volunteers, Meade served under McClellan in the Peninsular Campaign, and at Antietam. He also saw service at Fredericksburg and Chancellorsville, succeeding "Fighting Joe" Hooker as commander of the Army of the Potomac in June, 1863. A month later, he decisively defeated Lee at Gettysburg; but for his failure to pursue the Confederate general, he was relieved of his command. Later, however, he served under Grant and, in 1864, was made a major general. When the War was over, he took charge of one of the districts in the South under the reconstruction program. See CIVIL WAR IN AMERICA; GETTYSBURG, BATTLE OF.



GAY SONGSTER: THE MEADOWLARK

MEADOW LARK. Every person who has walked or worked in grassy fields and pastures knows the meadow lark and loves its clear whistle. Country boys learn to imitate its bit of song and enjoy holding duets with their feathered friends.

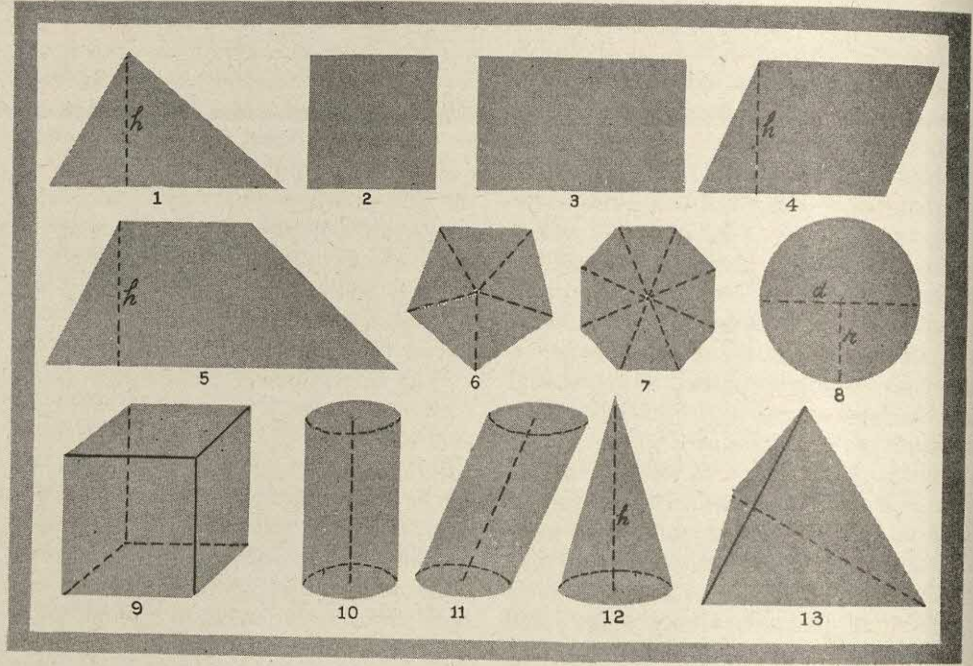
There are two species of meadow larks in North America, one in the East and one in the West. They breed north into lower Canada and winter from Southern British Columbia and the Potomac Valley southward. The two are very similar in habits and appearance, but the western form has a much finer song, said by some to be among the most beautiful of bird songs.

The meadow lark is about the same size as the robin, but somewhat stockier. It has a short tail and a long, sharp bill. The general color is a streaked brown above and yellow below. A black crescent appears on the breast, and the outer tail feathers are white, thus showing plainly in flight. The meadow lark belongs to the blackbird group and is not a *lark* in any sense.

MEASUREMENTS. A knowledge of how to take certain common measurements has great practical value in our daily lives. The process or act of measuring is called *mensuration,* a science which consists of finding the lengths of lines, the areas of surfaces, and the volumes of solids. Some of the rules for measuring are based on simple arithmetical computations; others on more complex geometric formulas. However, most of the measurements with which we are chiefly concerned can be worked out in arithmetic, and a familiarity with the necessary principles or rules is of benefit to people in all walks of life.

There are several basic figures which we must understand. These are the polygon, the circle, and various types of solid figures, such as the sphere, the cone, the pyramid, the prism, and the cylinder.

The polygon is a closed plane figure; that is, a figure which has length and width but not depth, and whose sides consist of straight lines. The simplest possible polygon is the triangle, which is a plane figure bounded by three sides. To find the area of such a figure the base is multiplied by one half the altitude, which is the perpendicular distance from the opposite point to the base. Another polygon is the quadrilat-



MEASURABLE SHAPES THAT FIGURE IN OUR DAILY LIVES

Discovering the dimensions of our tools and our environment requires a knowledge of these basic geometric figures. Most measurable objects fall into these classes: (1) Triangle. (2) Square. (3) Rectangle. (4) General parallelogram. (5) Trapezoid. (6) Pentagon. (7) Octagon. All these are polygons, and including (8), a circle, all are plane figures. (9) Cube. (10) Cylinder. (11) Cylinder section. (12) Cone. (13) Pyramid. All solid figures.

eral, a plane figure bounded by four straight lines. There are two general types of quadrilaterals: the parallelogram (which may be a square, a rectangle, or a rhomboid) and the trapezoid.

The parallelogram is a quadrilateral in which the opposite sides are equal and parallel. The area is found in all cases by multiplying the length by the height (altitude). The square is a parallelogram whose four sides are equal and whose four angles are right angles. The rectangle is a parallelogram having four right angles, but which is longer than it is wide. The rhombus is an oblique-angled parallelogram all of whose sides are equal. The rhomboid is an oblique-angled parallelogram longer than wide but having opposite sides equal.

The area of a trapezoid, a quadrilateral which has only two sides parallel, is equal to one half the sum of the parallel sides multiplied by the altitude.

Some polygons which have more than four sides are: the pentagon, with five sides; the hexagon, six sides; heptagon, seven sides; and the octagon, eight sides. The areas of such polygons are found by dividing the figure into triangles, finding the area of each triangle according to the formula given above, and adding the results together. If the sides of the polygon are of equal length, the figure may be divided into equal triangles and the area may be found by multiplying the number of sides by the area of one of the triangles.

The circle is a plane figure whose circumference, or outer edge, is everywhere equally distant from its center. If we were to divide a circle into a large enough number of equal triangles so that the space between the base of each triangle and the arc of the circle at that point were practically negligible, we should be able to get the approximate area of the circle in the same manner as we found the area of a regular polygon.

However, mathematicians have discovered a formula which saves this trouble. They have found that the circumference is always 3.1416 times the radius, and have adopted the Greek letter *pi* (π) to stand for that figure. They call it a constant because it expresses a relationship which never changes, no matter how large the circle is. If the radius is multiplied by itself or squared (r^2), then multiplied by 3.1416 (π), the result will give the area of the circle. This formula, expressed as πr^2, should be remembered, for it enters into many mathematical calculations.

Finding the surface area and the volume of a solid figure, such as a cone, a cube, a pyramid, or a prism, is somewhat more difficult, but certain general principles may be laid down for such computations. These solid figures have not only length and width, but also depth. The volume of a cube is found by multiplying together the height, length, and width, or cubing the length of any side. The area of the surface of a cube is found by multiplying the area of one of the sides by six, the number of faces on a cube.

The cylinder, a solid body which has equal and parallel circles for its bases and which has a uniform diameter, has a curved or convex surface. To find the area of the curved surface of such a figure, the circumference of the circle which forms one of the bases is multiplied by the axis (the straight line connecting the centers of the two bases). The volume of a cylinder is found by multiplying the area of the base by the axis (the length). The base being a circle, its area is found as explained above.

Other solid figures are the cone, the pyramid, and the sphere. The cone is shaped like an inverted ice-cream cone and has a circular base. A right circular cone is one whose vertex is on a perpendicular from the center of the base. The area of the curved surface of such a cone is found by multiplying half the circumference of the base by the slant height of the figure. The volume is found by multiplying one third the area of the base by the altitude ($1/3\pi r^2 h$).

The volume of a pyramid, which is like a cone except that the base is a polygon instead of a circle, may be found in the same way (one third the area of the base times the altitude). To find the area of the outer surface of a sphere, such as a croquet ball, multiply the circumference by the diameter ($2\pi r \times 2r\ hr = hr\ 4\pi r^2$). To find the volume of a sphere, multiply the surface area by one-third of the radius, producing the formula $4/3\pi r^3$.

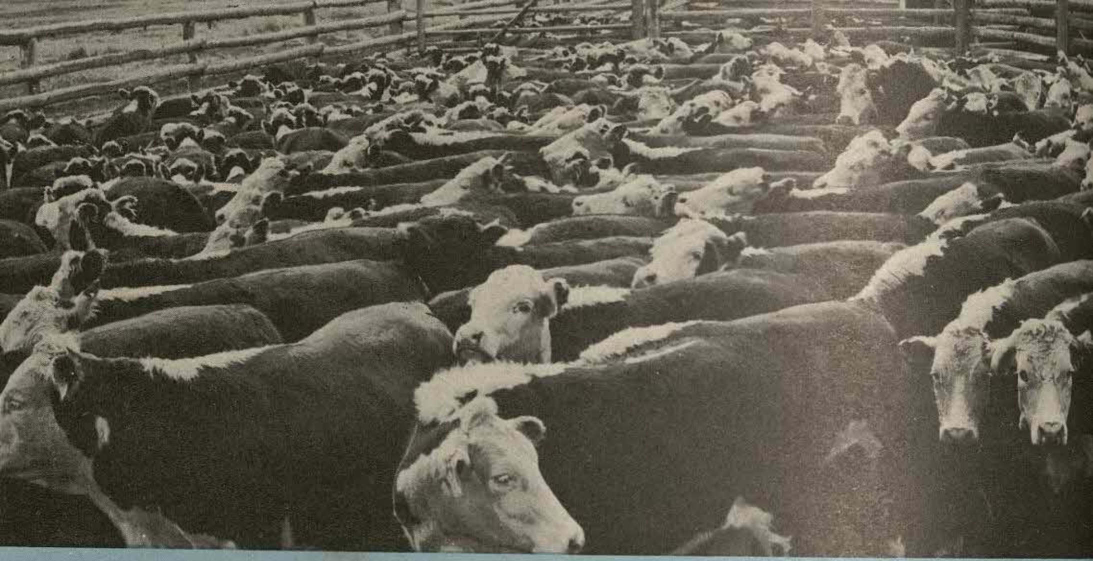
Why these rules of mensuration are as they are becomes clear when we have studied plane and solid geometry; but even without a knowledge of these subjects, we can handle the measurements easily. Mathematical tables, which have conversion formulas and statistics for every variety of measurement, and which will reduce any problem in measurement to a simple arithmetical computation, are now available.

Consult the following titles for additional information:

Angle
Arithmetic
Circle
Cone
Cubic Measure
Cylinder
Geometry
Lands, Public
Metric System
Prism
Pyramid
Triangle

MEASURING WORM. Long and slender, with its feet grouped at either end of its body, the measuring worm is the small caterpillar of certain moths. The worm moves along by drawing the hind feet up to the front set, thus looping its body, which is then thrust forward to full length. Because of this habit, it is also called *inch* or *loop* worm. On trees, these worms look like broken twigs. Some measuring worms are very destructive. See PROTECTIVE COLORATION AND MIMICRY.

MEAT. The most important of the nonvegetable foods in Europe and America is meat, the flesh of animals. Ordinarily, sea foods, such as the flesh of fish and crustaceans, are classified as fish and not as meat. The most important of the meats are beef, pork, veal, lamb, poultry, and, in certain localities, wild game, such as rabbit and squirrel meat and venison.



U.S.D.A., Lee

STEAKS ON THE HOOF

A herd of Montana cattle waits in the ranch corral for shipment to market.

Meat consists of muscle fibers bound together with connective tissue. The heavier the muscle and the greater the amount of connective tissue, the tougher will be the meat. This quality, of course, varies greatly in different cuts. Short muscle fibers and young animals provide the tenderest meats.

The special flavor and taste of meats are due to the presence of extractives, easily dissolved in water and consequently lost when meat is boiled. Roasting or broiling, therefore, retains the flavor and also preserves more of the food value.

Value of Meat as Food. Meat contains a larger percentage of protein than most other products except cheese, and for this reason it is an excellent tissue-building and energy-giving food. It also contains considerable amounts of fat and water, as well as valuable mineral salts. Liver, an animal gland, is a source of vitamins. Strange as it may seem, the tougher cuts of meat usually possess more food value and better flavor than do the tender ones. However, to secure the value of the increased food and flavor requires careful cookery.

One of the most easily digested meats is chicken breast; one of the slowest to digest is pork, because of its high content of fat. Beef and mutton are digested rather readily, while veal requires a longer time. The average calorific values per pound of the most popular meats are: mutton, 1,695; pork, 1,580; beef, 1,040. Eggs and beans are good substitutes for lean meat, since both are rich in proteins.

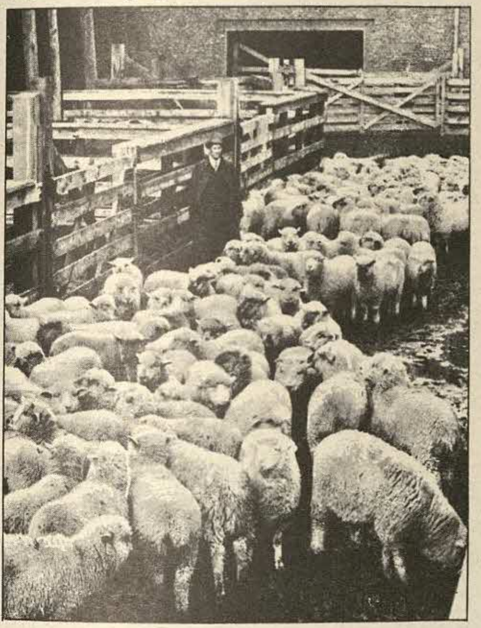
For additional information, consult the following articles:

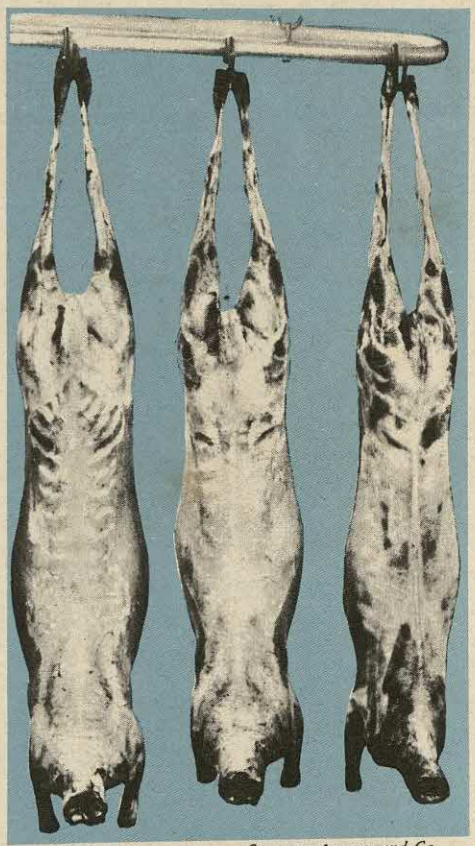
Bacon
Beef
Calorie
Cooking
Diet
Fat
Food
Meat Packing
Mutton
Pork

MEAT PACKING. Three fifths of the meat animals in the United States are raised west of the Mississippi. Two thirds of the meat is eaten east of the Mississippi. It is the responsibility of the meat packing industry to process the meat and bring it to the meat markets. The meat packing industry can be divided into three operations. First, the livestock is assembled in local markets from which it is shipped to large terminal markets. Next, the livestock is purchased by packing companies which slaughter and process the animals. The packing companies then distribute the meat to the wholesalers who supply the retailers.

Meat packing is the third ranking industry in the United States. The more than 2,000 meat-packing plants in the United States process annually about $7,000,000,000 worth of meat and its by-products. Every meat packing plant in the United States is under government supervision, assuring the buyer that all meat that reaches the table has been inspected.

Chicago, lying just a little west of the center of population and east of the cattle country, is the center of this great industry. However, other packing centers such as Saint Louis, Sioux City, Omaha, Kansas City, Fort Worth, Tex., Saint Joseph, Mo., and Milwaukee are increasing in importance.





Courtesy Armour and Co.

BEFORE AND AFTER—A QUICK, SANITARY JOB ON SOME LAMBS
The carload of "woollies" arrives at the packer's (left). Right, three grades of dressed lamb.

A Day at the Stockyards. Every day, fast cattle trains whisk livestock along the steel ribbons to the great stockyards of the Midwest. These trains are often given right of way over passenger trains, for every hour spent on the train means just so much loss of weight to the animals and a resulting loss to the farmer. On arriving at the stockyards, the animals are unloaded and watered, then placed in pens. Here they are inspected and bid upon by the buyers for the big packing houses; and immediately after they are sold, they are driven through great "runways" to the packing houses. Once in a packing company's private pens, the animals are allowed to rest twenty-four hours, and are then given shower baths and sent along the line to be slaughtered.

They are usually suspended on moving chains, and are killed by a blow on the head or by being cut in the throat. Slaughtering is done at the top of the packing plant. The bodies are carried downward, and each of many workmen has a specific duty to perform in the dressing process. By the time the carcasses have reached the ground floor, they are completely dressed. Only about six minutes are required to dress a hog, less than thirty minutes to dress a steer. Many of the larger companies have a daily slaughtering capacity of 100,000 animals.

Courtesy Swift and Co.

ROAST CHICKEN FOR YOU

Packers now prepare poultry in large quantities

The bodies are next chilled in a cold-storage room, where a temperature slightly above freezing is maintained. Hogs require about three days for complete chilling; beef carcasses are chilled from eight to ten days. Choice beef may be chilled for two or three weeks to allow it to ripen (become tender). The meat is shipped to distant points in refrigerator cars or trucks, which preserve temperatures almost as low as the chilling rooms. If the meat is to be shipped to foreign countries, it is carried in refrigerator ships which keep it chilled all the way.

The Products of the Industry. The products and by-products of the beef-, pork-, and mutton-packing industries number well into the hundreds. Briefly, the meats are classified as *fresh, salt,* and *smoked.* In addition to these meats there are dried beef, sausages, and canned meats. The varieties of pork are the most numerous, including hams, shoulders, loins, spareribs, bacon, and backbones; and the fat parts are made into lard. All meat is prepared according to the customs of the country to which it is to be shipped.

It has been said that the packers waste no part of the hog except the squeal; indeed, there seems to be a use for every part of the hog, sheep, and steer. Hides are transformed into leather; the blood is manufactured into fertilizer; the intestines of the sheep and hog are used as *skins* for frankfurters, Bologna, and other sausages; the bristles of the hog are made into brushes; and the horns and hoofs of the animals are converted into glue, soap, and oils. And so it goes, with not a trace of the animal being wasted.

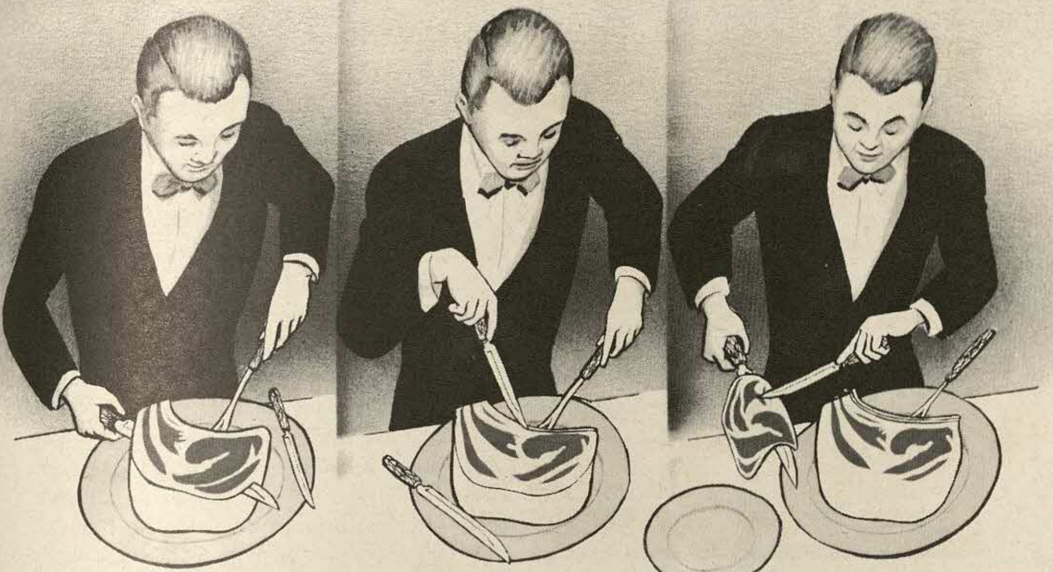
World Consumption of Meats. The Australians are, by far, the world's greatest meat eaters; the average consumption per person in Australia is 240 pounds per year. Next come the United States and Argentina, each with an annual consumption of 105 pounds per person. Canada ranks fourth, with ninety-five pounds per person; and the meat consumption of Britain is almost as much. Throughout the other countries of Europe, the consumption per person ranges between twenty-five and seventy pounds.

For additional information, consult the following articles:

Cattle
Cold Storage
Hog
Lard
Meat
Sausage
Sheep
Tallow

MEC'CA, or MEK'KA, ARABIA. To all Mohammedans, Mecca is the holy city, for it was the birthplace of Mohammed. In a narrow valley of sand, forty-five miles from the Red Sea, it is one of the capitals of the Kingdom of Saudi Arabia. The Kaaba, a cube-shaped building in the court of the Great Mosque, contains the sacred Black Stone. About 200,000 Moslems from all over the world visit Mecca each year at the time of the pilgrimage to kiss the Black Stone and perform other rites. The normal population is about 130,000.

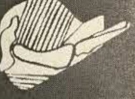
MECHANICAL, *me kan' ik al,* **POW'ERS.** Whether it is a simple device like the old-fashioned hand pump in the farmyard or a complex giant like the steam locomotive, every machine is based upon one or more fundamental mechanical powers. These primary machines are the wedge, the lever, the wheel and axle, the pulley,



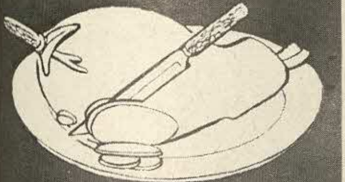
STANDING RIB ROAST. Place roast so that rib bones are at carver's left. Slice horizontally, from outside edge, across grain, to bone. Cut along rib with tip of knife to release each slice.

Carve enough to serve all guests before placing on individual plates.

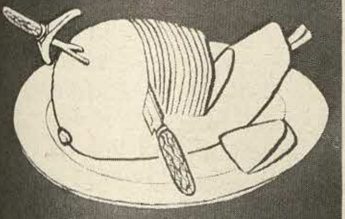
BAKED WHOLE HAM



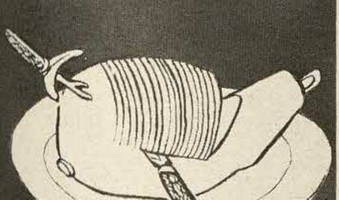
Location of bones and direction of slicing.

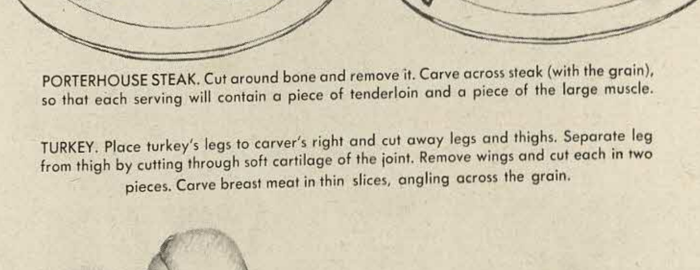


Place ham so that shank end is at carver's right. Cut first few slices from thin side.



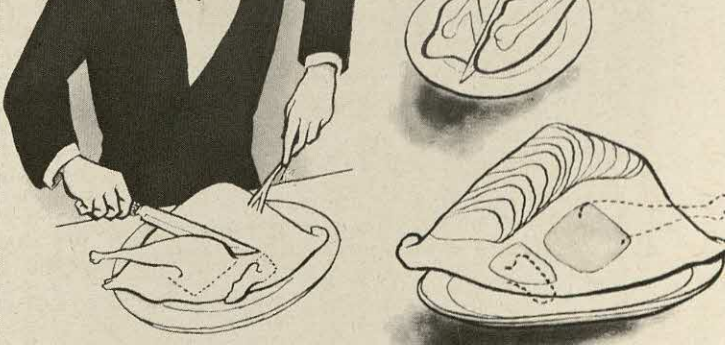
Turn ham to rest on carved side and cut slices down to bone. Release slices by cutting parallel to the bone.

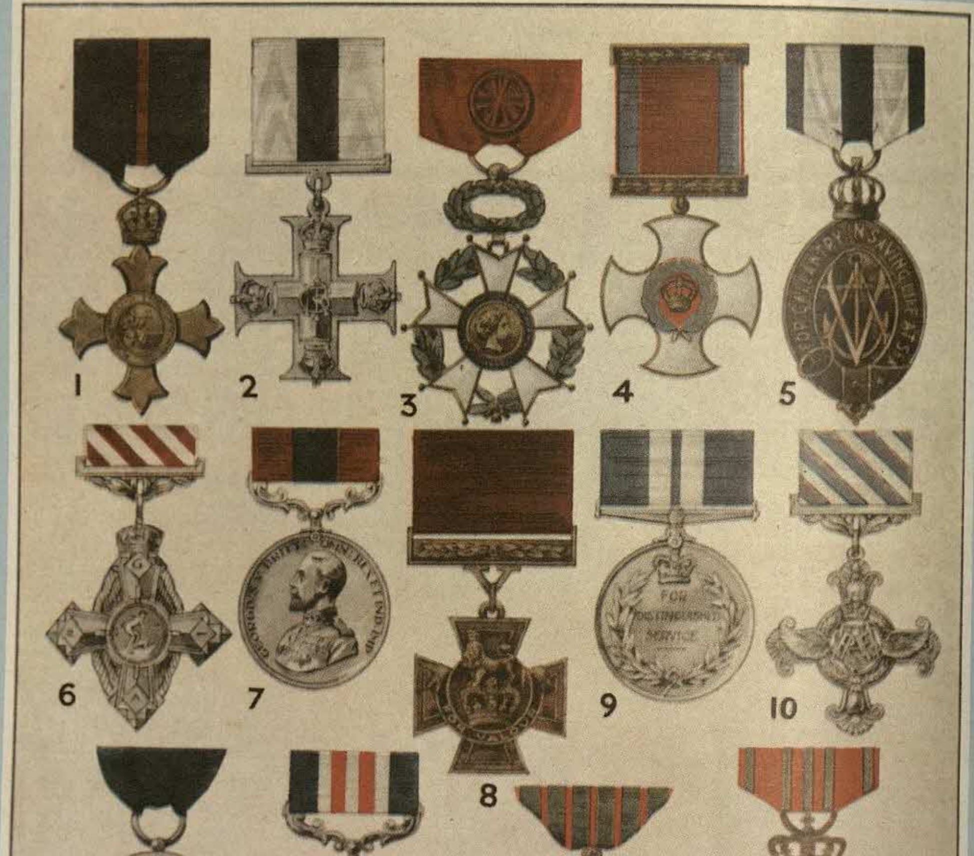




PORTERHOUSE STEAK. Cut around bone and remove it. Carve across steak (with the grain), so that each serving will contain a piece of tenderloin and a piece of the large muscle.

TURKEY. Place turkey's legs to carver's right and cut away legs and thighs. Separate leg from thigh by cutting through soft cartilage of the joint. Remove wings and cut each in two pieces. Carve breast meat in thin slices, angling across the grain.





THE NATIONS HONOR THEIR HEROES OF BATTLE

(1) Order of the British Empire. (2) Military Cross (British). (3) Legion of Honor (French). (4) Distinguished Service Order (British). (5) Albert Medal (British). (6) Air Force Cross (British). (7) Distinguished Conduct (British). (8) Victoria Cross (British). (9) Distinguished Service (British Navy). (10) Distinguished Flying Cross (British). (11) Military Valor Medal (Italian). (12) Military Medal (British). (13) Croix de Guerre (French). (14) Croix de Guerre (Belgian). (15) Distinguished Flying Medal (British). (16) Distinguished Service Cross (U. S. A.). (17) Iron Cross (German). (18) Distinguished Service Medal (U. S. Army) (19) Navy Cross (U. S. A.).

the inclined plane, and the screw. An ax blade driven into a log illustrates the principle of the wedge. The tack puller and the crowbar are forms of the lever. In simple terms, the wheel and axle are two cylinders, one large and one small, revolving about the same axis. If power is applied to a rope wound around the larger cylinder, a weight attached to a rope wound around the smaller one can be lifted with little effort. This is the principle in the steering wheel of the ocean liner.

The efficiency of the inclined plane is illustrated by the ease of rolling a barrel up a gangplank compared with the effort required to lift the same weight vertically. The simple automobile jack is an application of the principle of the screw. The pulley, by means of which heavy weights are hoisted, is an application of the principles of the lever and the wheel.

Each of the primary machines is described separately under its own title.

MECHANICS, *me kan′ iks.* Originally, this term was applied to the principles involved in the construction of machinery. Abstract mechanics today is divided into: *dynamics,* which concerns the forces that produce motion; and *kinematics,* which is the study of the different kinds of motion. See DYNAMICS; KINEMATICS.

MED′ALS. "For distinguished service," "for bravery in the field"—thus medals honor conspicuous bravery and courage. A small coinlike trophy, a medal is usually made of gold, bronze, or silver. There are three general types of medals. The commemorative medal marks some great historical event in the life of a country, while military and naval medals are bestowed upon soldiers and sailors who have shown special bravery in battle. There are also medals which are presented for pre-eminence in the arts, the sciences, or statesmanship.

Medals are usually made by either of two methods—cutting from a die or by casting. Medal making has long been a respected art, and was especially so among the Romans and Greeks. During the Renaissance, Vittore Pisano, Filippo Lippi, Benvenuto Cellini, and Albrecht Dürer were renowned for their beautifully cast trophies. In the modern nineteenth-century period, there has been a revival of the art, led by such men as David d'Angers, Chaplain, Roty, and Charpentier. Among famous American medal makers are Augustus Saint-Gaudens, John Flanagan, and Victor David Brenner.

In England, the first medal of any kind was presented to John Kendal in 1480 for bravery, and most of the early medals were given for this reason. Their use was not widespread in the United States until the Civil War, only one having been given in the American Revolution.

The following are among the famous medals of the nations of the world: the United States Congressional Medal of Honor, America's highest honor, first awarded during the Civil War in 1862; England's Victoria Cross, dating from 1856, and awarded to both military and civil personages for conspicuous bravery in wartime; Germany's Iron Cross, first granted in 1813; France's Cross of the Legion of Honor (1802), *Croix de Guerre* (World War I), and *Médaille Militaire* (1852); Belgium's Order of Leopold II (1900), and Japan's Order of the Rising Sun (1875). Most of these medals are bestowed only on military and naval officers for unusual gallantry and bravery.

MEDICI, *ma′ de che.* The world still remembers the Medici, greatest of the Italian families that flourished during the Renaissance. Beginning with Giovanni di Bicci de' Medici, who died in 1429, and ending with Giovan Gastone de' Medici, who died in 1737, the family produced bankers, merchants, dukes, cardinals, Popes, queens, and poets. Except for brief intervals, the family maintained rule over Florence, and always was the patron of learning and the arts.

The family had two divisions, the elder and the younger, deriving from Cosimo and Lorenzo, the first Medici's two sons. One of the descendants of the elder branch

MOTHER OF THREE FRENCH KINGS
Catharine de' Medici once wielded great power.

was Lorenzo the Magnificent (1449-1492), a fine poet in his own right, under whom Florence, the Renaissance, and the Medici reached their zenith. Catharine de' Medici (1519-1589), queen of France, was a great-granddaughter of this mighty ruler; Pope Leo X (1475-1521) was a son; and Giuliano (1453-1478), Lorenzo's brother, was the father of Pope Clement VII (1478-1534). Alessandro (1511-1537), Duke of Florence, was the last of the elder Medici rulers. A grandson of Lorenzo the Magnificent, Ippolito, was a cardinal.

The younger Medici, descended from the first Lorenzo, grew in power with Giovanni delle Bande Nere, great-great-grandson of the first Giovanni, and a powerful soldier. He married Maria Salviati, a granddaughter of Lorenzo the Magnificent. Cosimo I (1519-1574), his son, became Duke of Florence after the death of Alessandro; Francesco (1541-1587), his son, succeeded him, followed by another son, Ferdinand I (1549-1609), whose descendants ruled until 1737, when the Medici fell from power. Maria, wife of Henry IV of France, was a member of this branch of the family.

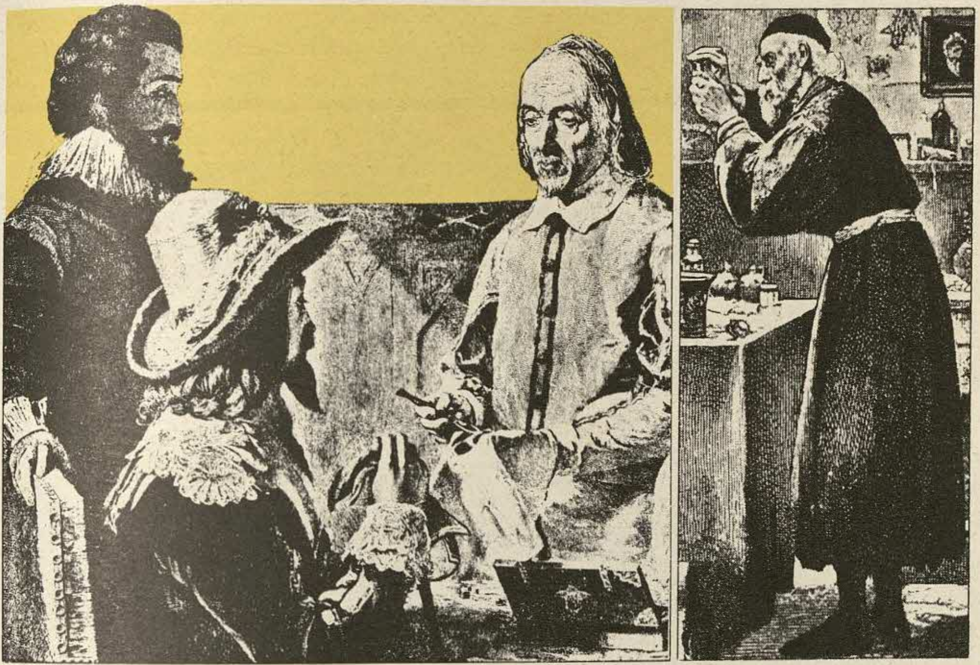
Ability to hold the support of the people, a talent for making strong allies, and wisdom in commercial and banking ventures enabled the Medici to maintain their power.

MEDICINE, *med'i sin.* Generally speaking, medicine is the science of preventing and curing ailments, both physical and mental. It may be divided into *medicine* proper, which deals primarily with the prevention and cure of ills by the use of drugs, and *surgery,* which deals with the cure of afflictions by the use of the surgeon's knife and other operative measures.

Through the science of medicine, serious epidemics of disease among both people and animals have been prevented. Through sanitary measures which rid the Canal Zone of the malaria-bringing mosquito, the building of the Panama Canal was made possible. Other tropical countries have been made livable for the white man by the draining of swamps, the supplying of pure drinking water, sanitary waste disposal, and the elimination of much-feared tropical fevers. Vaccination, inoculation, and drugs have all played important parts in this improvement. The general adoption of hygienic measures has resulted in an ever-increasing average length of life.

Medicine and the Community. Personal hygiene and public sanitation are definite and important parts of medicine. Under this latter group are included sewage disposal, water supply, milk supply, and the observance of local health rules. Matters of local health are the concern of health officers or boards of health, who are authorized to safeguard the health of entire communities. A health official may order a home to be placed under quarantine, or milk and food to be examined, and may even close the schools if he finds such a drastic step necessary. He has the power to order dogs muzzled, obnoxious weeds cut, and dangerous wells condemned, and to order any other procedure that may be necessary to protect the public.

In the United States, national public-health control is directed by the Federal Security Agency. The head of the department is the Surgeon General of the Public Health Service; he is assisted by a trained staff of chemists, biologists, and engineers. Each state, likewise, has a chief health



Right, courtesy Hygeia Health Magazine

TOWARD A MORE HEALTHFUL WORLD

Medicine was once the province of "apothecaries," men of little knowledge (right). Left, William Harvey, who discovered the circulation of the blood through the body.

officer, whose responsibility it is to look after the health of the state's citizens.

The American Red Cross, the Rockefeller Institute, the Association for the Prevention of Tuberculosis, and the Georgia Warm Springs Foundation for the treatment of infantile paralysis are among the outstanding private agencies for promoting good health.

History of Medicine. Primitive savages believed that diseases were caused by supernatural creatures, and usually attempted to cure such diseases by weird rites and ceremonies designed to please and placate these imaginary gods. Indeed, such ceremonies are still a common practice among the wild tribes of Africa. From these early savages, however, the white man learned the use of quinine and ipecac. There were several famous physicians among the early Greeks, Hippocrates and Galen being outstanding. Medical schools sprang up during the Middle Ages at Padua and Salerno, and in several other cities. The early Renaissance brought forth such famous doctors as Paré and Vesalius; in the seventeenth century, Harvey and Malpighi were outstanding. The following century produced such famous scientists as Hunter and Jenner, father of vaccination; and in the nineteenth century, Koch, Lister, and Pasteur added much to the medical knowledge of the world.

The present century has seen great developments in the field of medicine, such as the use of electricity, X-rays, and radium in medical treatment, the discovery of insulin as a remedy for diabetes and mental diseases, the widespread study of bacteriology, and the discovery of vitamins and their properties. The twentieth century is an age of specialization in medicine, as in other fields; such a separation of work makes the specialist an expert in his chosen field.

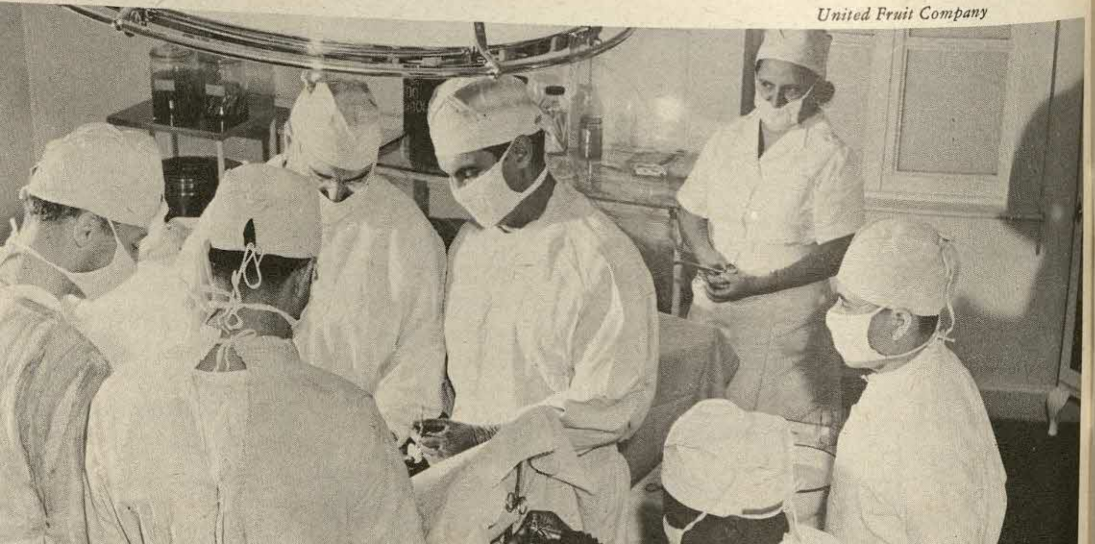
The art of surgery has kept pace with the phases of medical science discussed in the foregoing paragraphs, and so, too, has the

Above, from one of a series of oil paintings, "A History of Pharmacy in Pictures," commissioned by and copyrighted by Parke, Davis & Co.; reproduced by special permission. George A. Bender, project director; Robert A. Thom, artist.

MEDICINE ACROSS THE AGES

The cave men, above, had crude methods but they learned much about healing through trial and error. The modern surgical operating team, below, uses specialized equipment and sterile conditions in service to mankind.

United Fruit Company



rapidly developing science of orthopedics, for the correction of deformities.

The scope of this subject is too broad to be covered in one article. Additional information may be found under:

Anesthetic
Antiseptic
Antitoxin
Arsenic
Bacteria
  and Bacteriology
Caffeine
Camphor
Castor Oil
Chiropractic Healing
Chloroform
Cinchona
Cod-liver Oil
Diet
Digestion
Disinfectants
Drowning
Ether
Germ Theory
  of Disease
Hemlock
Hospital
Hygiene
Morphine
Nightshade
Nurse
Orthopedics
Osteopathy
Pepsin
Pharmacy
Physical Education
Sanitary Science
Sassafras
Serum Therapy
Squill
Stethoscope
Strychnine
Surgery
Tannin
Vaccination

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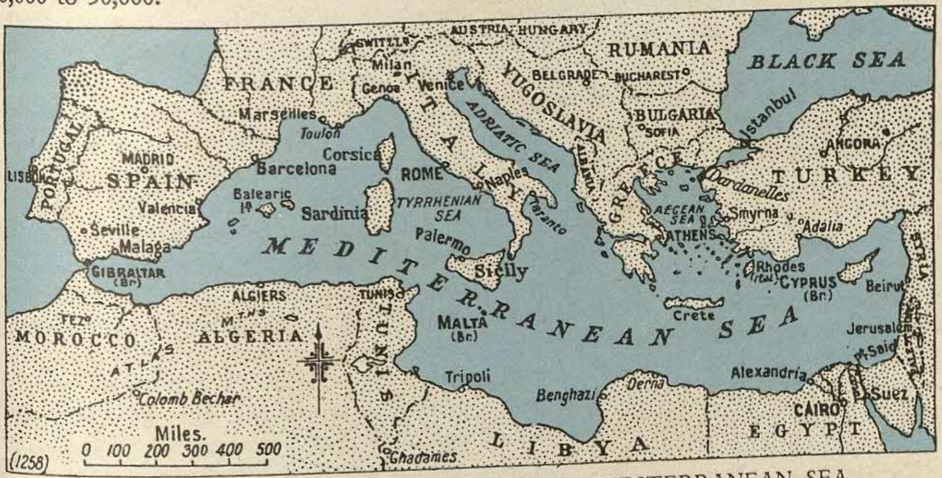
Mayo, Charles and
  William
Pasteur, Louis
Simpson, James Y.

MEDINA, *ma de'nah,* SAUDI ARABIA. At this sacred city of Islam is the tomb of Mohammed, who died there in 632. Moslems making their annual pilgrimage to Mecca, 250 miles to the north, usually visit Medina also. The city's population is estimated at 30,000 to 50,000.

MEDITERRANEAN, *med i ter a'ne an,* **SEA.** It is probable that no single geographical feature has influenced history more than has the Mediterranean Sea. At one time all the known world was around this sea. Along or near its shores flourished the greatest of the ancient civilizations. Depending upon it for their trade and communication were ancient Crete, Phoenicia, Assyria, Egypt, Greece, and Rome. (See the articles on these countries.)

Long before man ventured onto the Atlantic, a thriving commerce existed on the Mediterranean. The Mediterranean is even more important now than it was in ancient times. Today it is a great trade route connecting America and Europe with Asia. Control of this route means virtual control of world trade, for the Mediterranean gives access to the largest trading regions. In modern times England has held the balance of power in the Mediterranean, which constitutes her life line to her possessions in the East. Other nations, however, have tried to gain control, and during World War II the struggle for power in the Mediterranean was very bitter.

The Mediterranean is dotted with islands, many of them large and historically important, such as Crete, Sardinia, Corsica, and Malta. It is about 2,300 miles long and attains a maximum width of over 1,000 miles. The total area is more than 1,000,000



EMBATTLED HIGHWAY TO ASIA—THE MEDITERRANEAN SEA square miles. It varies in depth up to 14,000 feet.

The Mediterranean is a landlocked sea separating Europe and Africa. It joins the Atlantic through the Strait of Gibraltar and is connected with the Red Sea by the Suez Canal. The Black Sea flows into it through the Bosporus, the Sea of Marmora, and the Dardanelles. The Adriatic, Aegean, Tyrrhenian, and Ionian seas are arms of the Mediterranean.

MEDUL'LA OBLONGA'TA. Forming the junction between the spinal cord and the cerebellum is the medulla oblongata, often called the "vital knot" because a severe blow there will cause instant death. It is about an inch long and shaped somewhat like a pyramid. Not only do all the nerve fibers on their way to the brain pass through it, but the medulla oblongata is also the seat of important nerve centers of the respiratory, circulatory, and digestive systems.

For additional information, consult the following titles:

Brain
Cerebellum
Cerebrum
Nervous System

MEDU'SA. In the Greek legends, Medusa, one of the Gorgons, was once a beautiful girl who boasted to Athena of her beauty. Angered, the goddess changed her into a monster with brazen claws and teeth and writhing serpents for hair. A glance at her turned men to stone. Medusa was killed by Perseus. See GORGONS; MYTHOLOGY.

MELBOURNE, *mel'burn,* AUSTRALIA. On the southeast coast of Australia lies Melbourne, capital of the state of Victoria and one of the principal Australian ports. It is near the mouth of the Yarra River. The streets of Melbourne are wide and beautiful, the buildings modern. Among the outstanding structures are the mint, treasury, Houses of Parliament, library, and university. Founded in 1835, the city was chartered in 1842. A Centennial Exposition was held there in 1888 in celebration of the founding of Australia in 1788. The population is over 1,700,000.

MELODRAMA, *mel o drah'ma.* A romantic play in which the interest is held by startling situations and surprises is a melodrama. Often its central theme is love, and it is characterized by exaggerated sentiment. The term originally meant a drama in which the speech of the actors was accompanied by music. See DRAMA.

MEL'ON. Important members of the gourd family are the melons, most of which grow on trailing vines, but some of which are climbers.

Consult the following articles for additional information:

Casaba
Gourd
Muskmelon
Watermelon

ME'LOS, or MILO, *me'lo.* One of the Cyclades in the Aegean Sea, Melos is an island belonging to Greece. It has an area of about fifty-four square miles and a population of about 5,000. It was here that the famous statue, Venus of Milo, was found in 1820. The statue is now in the Louvre, in Paris.

MELTING POINT. The temperature at which a solid changes into a liquid is its melting point. Freezing is the reverse of this process—the changing of a liquid into a solid. The freezing and melting points of a substance are the same. Crystalline solids, such as ice, remain at the same temperature throughout the melting process; some substances, such as wax, have no definite melting point and fuse gradually. Water, when freezing, expands; for this reason water pipes often burst in cold weather. The amount of heat absorbed by a substance changing from a solid to a liquid is also the amount given off in changing from a liquid back to a solid.

In freezing ice cream, salt melts the ice, greatly lowering the temperature and absorbing the heat from the cream, solidifying it. Although most metals fuse at high temperatures, the melting point becomes less when they are mixed together to form an alloy. Certain alloys have melting points so low that they are used as electrical fuses and in automatic sprinklers to turn on the water to extinguish fires. Below is a table of melting points of a few substances:

Tungsten	3370°C.	Water	0°C.
Iron	1535°C.	Ethyl Alcohol	—117°C.
Copper	1084°C.	Oxygen	—218°C.
Lead	327°C.	Hydrogen	—259°C.

See Freezing.

MEMBRANES, *mem'braynz.* Scattered throughout the body are thin tissues which serve as covering for organs and bones and linings for various cavities, and in some cases secrete fluids which act as lubricants. These tissues are membranes.

There are three types of membranes, *mucous, serous,* and *fibrous.* Mucous membranes line all cavities which lead to the exterior of the body. The entire alimentary canal, twenty-seven feet in length, is lined with mucous membrane. This membrane also lines the nose, throat, middle ear, sinuses, lungs, windpipe, larynx, kidneys, bladder, and other parts of the excretory system. This membrane secretes a mucus for lubricating the nose and throat, and in the stomach it produces digestive juices.

Serous membranes are of two types: those which cover such organs as the heart, lungs, and abdominal organs; and the synovial membranes, which line the joints and secrete the synovial fluid needed to lubricate them.

Fibrous membranes, which are composed of fibrous connective tissue in parallel threads, cover the joints and bones as well as line the inside of the skull. This membrane also serves as a sheath for the spinal cord and forms a fibrous covering for certain glands.

MEM'LING, or MEM'LINC, Hans (1430?-1494). One of the greatest of Flemish artists, Hans Memling is noted for the beauty of the figures in his portraits, which he painted with great accuracy and detail. A pupil of Van der Weyden, he confined most of his work to religious subjects. Among his paintings are: *Virgin and Child; Marriage of Saint Catherine; The Madonna Enthroned, with Saints and Donors; Martyrdom of the Baptist,* and *Saint Christopher and the Infant Christ.* Many of Memling's paintings are in Bruges, where he lived and worked.

MEM'NON. An Ethiopian king who appeared in the Homeric poems as aiding Troy against the Greeks, Memnon killed Antilochus in battle but was himself slain by the Greek hero, Achilles. His name was later given to an immense statue (one of two known as the *Colossi,* because of their great size), which still stands on the site of ancient Thebes in Egypt. This statue was famous in the ancient world because it made musical sounds each morning as the sun rose. The sounds were caused by the action of the sun's rays, which rapidly changed the temperature of the damp stone. See Colossus.

MEMORIAL DAY. Originally a day set apart to honor the memory of the Civil War dead, Memorial Day now includes special services honoring the dead of the Spanish-American War and World Wars I and II as well. The observance of the day began in 1868 when General John A. Logan, commander in chief of the Grand Army of the Republic, selected May 30 as a day to honor the Union army's dead. Memorial Day is still observed in the North on May 30; but in the South the Confederate dead are honored on an earlier date, usually April 26.

MEMPHIS, *mem'fis.* Once the capital of ancient Egypt, Memphis today is merely an object of interest to archaeologists and tourists. Here are found a huge statue of Rameses II and the tombs and pyramids of Sakkara. The ruins are twelve miles from Cairo on the west bank of the Nile.

MEM'PHIS, Tenn. Extending along the Mississippi water front in Southwestern Tennessee is Memphis, largest city in the state and county seat of Shelby County. The city is an important educational center of the South. Among its institutions of higher learning are medical, dental, nursing, and pharmacy departments of the University of Tennessee, a state teachers college, Southwestern College, and LeMoyne College for Negroes. The city also has a Museum of Natural History and Industrial Arts and the Brooks Memorial Art Gallery. Over a thousand acres of beautiful parks and extensive zoölogical gardens are among the recreational attractions of Memphis.

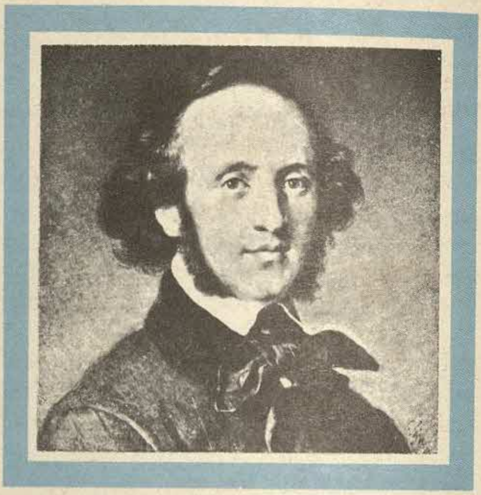
A settlement on the site of Memphis was said to have been founded by De Soto in 1541. Almost 200 years later, in 1739, the French built a fort there. In 1849 a city was established, but a series of yellow-fever epidemics that started six years later reduced it to a taxing district in 1879. Memphis regained its city charter in 1893 and has continued to grow. The population is about 500,000.

The city is a manufacturing center and is also one of the world's greatest cotton markets.

MENDEL'S LAW. An abbot of the Augustinian order at Brünn, Austria, Gregor Johann Mendel studied the law of inheritance of characters in organisms, and published his findings in 1866. While experimenting in the hybridization of garden peas, he noted that when two plants having contrasting characters, such as smooth seeds or wrinkled seeds, were crossed, the hybrids of the first generation exhibited only one of these characters, though the other character was present, as shown by its appearance in later generations. The character showing smooth seeds, in this instance, Mendel called *dominant,* while the other character, wrinkled seeds, hidden in this case, he called *recessive.*

When a second generation of hybrids is grown from self-fertilized seed, the individuals of this generation will differ from one another in a definite ratio: three will show the dominant character and one the recessive. Mendel's work went unheeded until it was rediscovered in 1900 and made the basis of the modern science of genetics. See HEREDITY.

MENDELSSOHN-BARTHOLDY, *men' del sone bahr tole' di,* FELIX (1809-1847). The lilting and melodic qualities of such music as the overture to *Midsummer Night's Dream* amply demonstrate the reason for Felix Mendelssohn's popularity and success as a composer. Born in Hamburg, Mendelssohn began his musical education early, making a public appearance at the age of nine, and writing the overture to the Shakespearean drama at sixteen. After a long European tour which began in 1829, the composer became a musical director in Dusseldorf in 1833. In 1835 he conducted concerts in Leipzig, and brought about the organization of the Leipzig Conservatory. Among his best-known compositions are *Songs Without Words,* which include the *Spring Song;* two oratorios, *Saint Paul* and *Elijah;* and a cantata to Goethe's *First Walpurgis Night.*

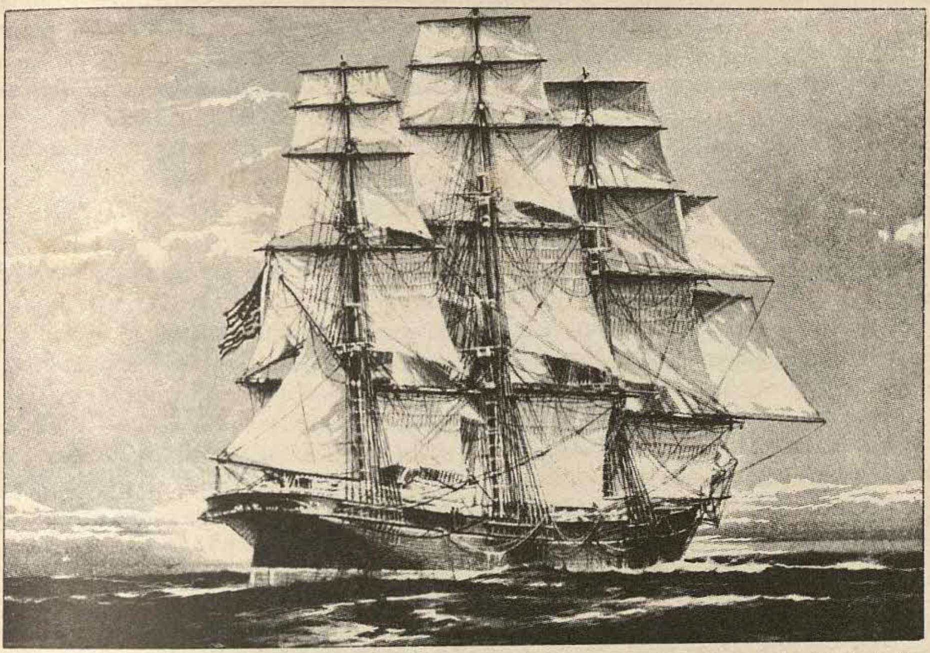


YOUTHFUL MUSICAL GENIUS

Felix Mendelssohn, well-loved German composer.

MENELA'US. King of Sparta and the husband of the famous Helen of Greek legend, Menelaus led a fleet of ships to the long siege of Troy. The war was fought over the abduction of his wife, who had been carried off by Paris, son of the king of Troy. After the final battle, which is described in the *Iliad* of Homer, Menelaus returned to Sparta with Helen, completing a long voyage which took him to Cyprus, Phoenicia, Egypt, and Libya. See HELEN; MYTHOLOGY; TROY.

MENHADEN, *men ha'd'n,* or **MOSS'-BUNKER.** Fishermen in boats in the North Atlantic sometimes see large schools of menhaden swimming so closely together and so near the surface that the upper fish are partly out of the water. Menhaden are small-sized fish related to the herrings.



Courtesy Popular Mechanics

PRIDE OF THE AMERICAN MERCHANT MARINE IN MID-1800's
Clipper ships, fastest vessels afloat, carried American cargoes to world's chief ports.

They are probably the most abundant fish on the eastern coast of North America. They feed entirely upon very small forms of sea life, and serve as food for larger fish. Their only defense against complete destruction lies in their great productivity. It is believed that menhaden lay their eggs in brackish water. A single female has been found to contain as many as 140,000 eggs.

Menhaden are caught in nets of various types. They are used to some extent as food, and the young fish have been canned in oil, like sardines. A valuable fish oil is extracted from menhaden, and the residue is valuable as a fertilizer. Fish meal, a food for domestic animals, is also manufactured from menhaden.

MEN'NONITES, a Protestant group which refuses to take oaths or bear arms. The Mennonite movement was founded in Zurich, Switzerland, in 1525. It was named for Menno Simons (1492-1559), a native of East Friesland who was important for his efforts to unite the various factions of the early group. The Mennonites spread rapidly throughout Switzerland, Germany, and Austria; and because persecutions were frequent, many of them settled in Holland and Moravia. In the latter part of the seventeenth century, the first Mennonite settlement was established in the United States at Germantown, Penn., and after 1871 many more emigrated from Russia to avoid conscription, settling in the Dakotas, Minnesota, and Kansas. At present the group has approximately 160,000 members in the United States.

MENSURATION. See MEASUREMENTS; METRIC SYSTEM.

MERCATOR'S, *mur ka' turz,* **PROJECTION.** See MAP.

MER'CHANT MARINE. Ocean commerce is very important to a country, and all the ships, whether owned by the government, or privately, which carry on that commerce are its merchant marine. The supremacy of trade on the high seas is very important in determining a country's wealth and power; consequently, each nation seeks to encourage the building of ships and trade with other countries. Although for many years the United States has not had a large merchant marine of its own, it has maintained a fair share of world trade by having ships of other nations carry its products. The weakness of such a policy was shown during World War I, when foreign ships were not available for carrying American goods and the Federal government had to resort to a hasty building program for passenger and freight transport vessels.

Before the Revolutionary War and during the Napoleonic Wars in Europe, the American merchant fleet led in sea-borne commerce, primarily because the ships of other powers were engaged in warfare. Following the downfall of Napoleon and the Congress of Vienna, Great Britain set out to regain her former commercial prestige. The decline of the American marine was completed with the Civil War, when most of the merchant ships were either sunk by gunboat attacks or were sold abroad. From that time until World War I, Great Britain and Germany held undisputed sway over ocean-going trade.

When American commerce appeared so severely crippled following the entry of the United States into the First World War, Congress created the United States Shipping Board, which in turn set up the Merchant Fleet Corporation. Great shipyards were erected and large ships were hurriedly constructed, so that the shipping capacity of the American fleet was increased tenfold. Following the Armistice, the board sold its ships to private companies, which agreed to continue operation of trade routes established by the board.

The United States Maritime Commission was established in 1936 and six years later the War Shipping Administration was formed. These two government agencies were responsible for the United States' maintaining the largest merchant marine fleet in the world during World War II, a position it still holds. Shortly after the war, the Maritime Commission undertook the selling of surplus "Liberty" and "Victory" ships. However, the Commission also made plans for the building of about fifty new ships a year. The United States now has more than 25,500,000 gross tons of commercial ships. See COMMERCE; SHIP.

MER'CURY, or QUICKSILVER. This bright, silver-white metal has such a low melting point that it is a liquid at all ordinary temperatures. It is the only metal having this characteristic, one which makes it invaluable for thermometers. Mercury is so heavy that a ball of lead will float in it. At a temperature of 20°C., it is 13.546 times as heavy as an equal volume of water. The symbol of the element is *Hg,* from the Latin *hydrargyrum,* meaning *silver water.*

The most common ore of mercury is cinnabar, a soft, brilliant-red compound of mercury and sulphur. The mines of Almaden in Spain and those in Italy near the head of the Adriatic Sea are the most important European sources of the ore. In the United States, Oregon and California are the principal sources.

About the home, mercury is most commonly seen in thermometers (see THERMOMETER). It was formerly a common practice to "silver" the backs of mirrors with an amalgam of mercury and tin, but genuine silver is now deposited on mirror backs by a chemical process. An alloy of silver, tin, gold, and zinc amalgamated with mercury forms a substance widely used for filling cavities in teeth. In the amalgamation process of extracting gold and silver from their ores, mercury is essential. The element is also used in the manufacture of scientific apparatus, in the preparation of fulminate of mercury (an explosive), and sometimes in boilers as a substitute for steam. Compounds of mercury are widely used in medicine.

MERCURY. Of all the planets, Mercury is nearest the sun, its mean distance being about 36,000,000 miles. It is so near, in fact, that it gets six and one-half times as much heat as the earth. Mercury is the smallest of the planets, and its diameter of 3,000 miles is only about equal to the east-west distance across the United States. Its density is somewhat less than that of the earth. This fact, combined with its small size, makes the pull of gravity on its surface only one third as great as it is on the earth. Whether or not there is an atmosphere on Mercury has not yet been ascertained.

The motions of this planet are of exceptional interest. Its period of revolution, or *year,* is the shortest of all the planets—only eighty-eight of our days—while its time of rotation, or *day,* is the same as its year. As is the case with our moon, then, the same side of Mercury is, with slight exception, always turned toward the sun, almost one half having perpetual day and almost one half having perpetual night. As a result, one side must be very hot, the other extremely cold. Life as we know it cannot, of course, exist under such conditions. See ASTRONOMY; PLANET; SOLAR SYSTEM.

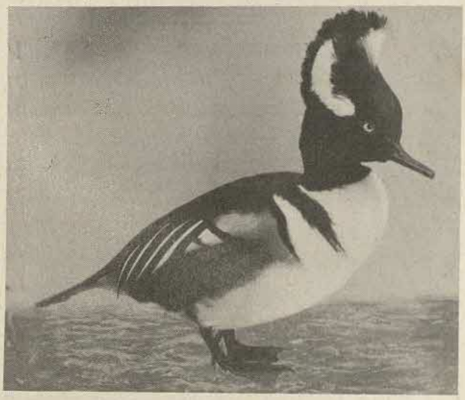
ROMAN GOD OF COMMERCE—MERCURY

MERCURY. The mischievous, but gay and charming "bad boy" of the ancient Roman gods was Mercury, known as Hermes in Greek legend. He was the messenger of the gods and the son of Jupiter and Maia. According to the legend, Mercury invented the lyre. This lyre he had to present to Apollo because he had hidden cattle which Apollo was watching, and had eaten two of them. In return for the lyre, Apollo gave Mercury his most characteristic emblem, the caduceus—two serpents entwined about a shaft surmounted by wings. Because he was the messenger of the gods, Mercury was also given a small sword, a winged cap, and winged sandals, with which he could make himself invisible and which could take him any place in an instant. Among Mercury's other duties was conducting the souls of the dead to Hades and acting as the god of eloquence and commerce.

MERCY, SISTERS OF. Officially known as the Order of Our Lady of Mercy, the Sisters of Mercy constitutes a sisterhood in the Roman Catholic Church, with establishments in America and Europe. The order was founded for charitable purposes, its members devoting themselves to nursing the sick and performing various other acts of mercy in their communities.

MER DE GLACE, *mair de glas.* Moving almost three feet a day during the summer and autumn, Mer de Glace is the most famous of all glaciers in the European Alps. It is located on the northern side of Mont Blanc and has a total area of sixteen square miles. The lower end, known as the Glacier des Blois, flows into the Arveyron River in the Chamonix Valley, not far from the village of Chamonix.

MER'EDITH, GEORGE (1828-1909). A writer of great ability and power, George Meredith was an outstanding novelist of the nineteenth-century Victorian Period. He is famous for the brilliant, penetrating character studies found in his novels. Born in Hampshire, England, and educated in Germany, the author studied law for a time. His first publication was a volume of poems, which appeared in 1851. Eight years later, his well-known *Ordeal of Richard Feverel* was published, and this was soon followed by other works, which gave Meredith his place among the important novelists of the period. Among his other novels are *Rhoda Fleming, The Adventures of Harry Richmond, The Egoist, Diana of the Crossways,* and *The Amazing Marriage.*



American Museum of Natural History

MR. MERGANSER LIKES FISH

MERGANSER, *mur gan′ sur.* Several kinds of fish-eating ducks are called mergansers. They have narrow, roundish bills with hooked points and notched edges. From the last characteristic comes another common name for these birds, *sawbills;* they are also called *sheldrakes.* Three species occur commonly in North America, the *American* merganser, the *red-breasted* merganser, and the *hooded* merganser. They are ducklike in appearance, but have rather prominent crests. The males are usually black and white and the females grayish brown. The American merganser has a glossy greenish-black head; the red-breasted has a broad, reddish band across the breast; and the hooded species has an especially large black and white crest.

Though mergansers are more numerous northward, they breed over much of the United States and Canada, and winter from Alaska and Greenland to Mexico. All three species dive for food, which consists of fish and mollusks. They also eat insects, crustaceans, and some vegetable matter. Their flesh is not very palatable.

MERIDIAN, *mer id′ i an.* To aid in describing the location of a point on land and sea, the map of the surface of the earth has been divided by north-south lines, or *meridians,* and by east-west lines, or *parallels,* much the same as a modern city is cut up into block by streets. And, just as in a city the streets may be numbered beginning with Main Street, so one meridian called the *prime meridian* is the starting point for the numbering of other meridians. Most countries use the meridian passing through Greenwich, England. From this prime meridian the other meridians are numbered east and west to that of 180°, which passes through the central part of the Pacific Ocean.

Because the meridians run north and south, it follows that all points upon the same meridian have the same sun time. See LATITUDE; LONGITUDE.

MEROVINGIANS, *mer o vin′ je anz.* The first line of Frankish kings to rule in Gaul was called the Merovingian Dynasty. King Clovis was the first of the line, which derived its name from his grandfather, Merovaeus. Clovis ended all Roman rule in Gaul in 486. During the following 250 years the line grew gradually weaker, until in 751 the last king, Childeric III, was deposed by Pepin the Short, first of the Carolingian kings. See CAROLINGIANS.

MER′RIMAC, THE. See MONITOR AND MERRIMAC.

MESA, *ma′sah.* This word is from the Spanish, indirectly from the Latin, and means *table.* It refers especially to the isolated tablelands which rise above the plains in Southwestern United States, particularly in the Colorado Valley. They are the remnants of former plateaus, worn away by the process of erosion. The two most famous mesas are the *Mesa Verde* and the *Enchanted Mesa.* The former, which is in the southwestern corner of Colorado, is fifteen miles long, eight miles wide, and 400 to 800 feet above the plain. It is covered with grass, small cedars and shrubby plants. Along its sides are the interesting ruins of an ancient civilization. The Mesa Verde is one of the national parks of the United States.

The Enchanted Mesa, in the west-central part of New Mexico, is a sandstone rock rising abruptly from the plain to a height of 430 feet. The Acoma Indians, who live near by, believe their ancestors inhabited the summit, and it is because of the superstition with which they regard it that the mesa has received its name.

MESOPOTA'MIA. See IRAQ.

MESQUITE, *mes keet'*. See CHAPARRAL.

MESSI'AH. In the Old Testament, priests and kings who had been anointed with holy oil were given the title Messiah, which means *anointed*. The term has a special application in the prophecies of the Old Testament to the coming of a king who would free and restore the Kingdom of Israel and rule it wisely and well. Christian churches accept Jesus as "The Messiah," regarding His as a spiritual kingdom.

METABOLISM, *me tab' o liz'm*. All the changes which take place in the foodstuffs after they have been absorbed from the digestive tract, and also the changes that take place in the living tissue of the body, are included in metabolism. Those changes which constructively build up tissue or form complex substances out of simple ones are known as *anabolism*. Those changes which destructively break down tissue or form simple substances out of complex ones are known as *catabolism*. If no food is taken, metabolism is supported by the body itself. That is, the body consumes its own tissues to secure energy, in order that the body processes (circulation, respiration, muscle tension, etc.) may be carried on. When food is taken to supply the energy, then the body substance is protected.

The metabolism of proteins, carbohydrates, and fats could not be carried on at all without the presence of water. It must be present in every tissue for the maintenance of life itself. There would be no digestion, circulation, respiration, assimilation, elimination, or any of the metabolic processes without water. Two thirds of the weight of our bodies consists of water. We have proof of the benefits of drinking large amounts of water as an aid to digestion. While water cannot in itself furnish energy in metabolism, as do the proteins, fats, and carbohydrates, yet it may, by its presence, bring about a more complete assimilation of foods, and in that sense increase body weight. See DIET; DIGESTION.

SYMBOL OF TECHNOLOGY
The machine age is based on its metals.

MET'ALS AND METALLURGY, *met' al ur ji*. Modern civilization towers above the rest of history like a soaring skyscraper, a structure that has its foundations in the soil but its framework and exterior in metals. It has been man's advancing knowledge of the uses of metals that has allowed him to build the modern society he knows today. The use of one metal alone, iron, has lifted man from the status of a farmer and shepherd to a life that in its everyday aspects is more wonderful than the ancients ever visioned.

In transportation, the railroad, the automobile, the tractor, and steamship all depend chiefly on the use of metals. Manufacture, with its vast use of metallic machinery and its development of power; architecture, with its all-metal construction of buildings; engineering, with its graceful, strong bridges; communication, with its millions of miles of metal wires linking all corners of the earth, and agriculture, with its metal plows, reapers, binders, and tractors, all have shared in the blessings of metal.

Metals possess a certain luster, a resistance to the passage of light, and a conductivity to electricity and heat. Some can be beaten into any number of shapes, others can be drawn out into wires; some are found pure, while others, like iron, are mined in combination with other substances in the form of ore. The variations between the various metals are extremely wide. For example, metallic sodium is as soft as cheese, while metallic tungsten is much harder than glass; pure iron is tough and strong, while pure antimony is weak and brittle; metal mercury is a liquid at ordinary temperatures, while metal tungsten becomes liquid only when heated above 3370°C.

Only about one fourth of the more than sixty metals known to chemists are in common use. The most important are iron, copper, lead, silver, gold, zinc, aluminum, and nickel. Of less importance, though much used for special purposes, are tin, antimony, bismuth, arsenic, cobalt, manganese, tungsten, cadmium, and mercury.

Those metals found in a pure state are copper, gold, silver and mercury, although pure iron is often found in meteorites. Metals all combine with oxygen, sulphur, and chlorine to form *oxides, sulphides,* and *chlorides.*

Metallurgy is the art, and the application of science to the art, of extracting metals from their ores and adapting them for use. A person who is specially trained to carry out this work is called a *metallurgist,* or a *metallurgical engineer.* He takes the ore as mined and puts it through whatever process is best adapted to produce the free metal in the most economical way.

Metal is usually extracted from the ore by smelting, or melting the ore with fluxes which take away all the gangue, or worthless part. Some metals, however, can be extracted merely by crushing the rocks in which they are found and separating them from the rock materials by water-gravity methods. Still others, the sulphides, must be crushed, then separated from the foreign matter by a flotation process, then roasted, and then smelted repeatedly.

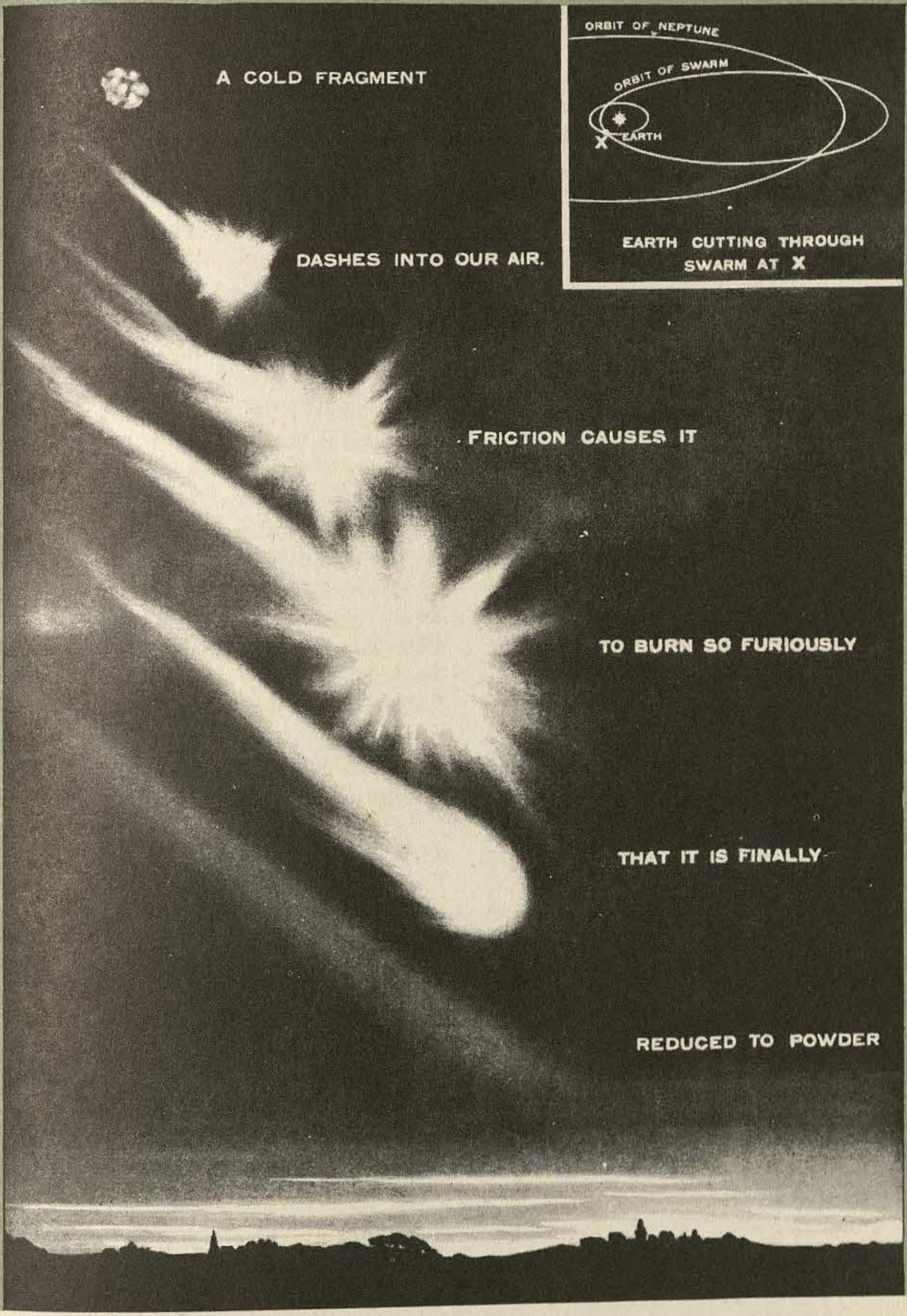
A process known as *amalgamation* is sometimes used to extract gold and silver from ores. First the ore is crushed; the metal is dissolved in mercury, and then is separated from the mercury by distillation. Cyanide and electrolysis are also used in extracting metals from ores. Sodium cyanide dissolves gold and silver from ore which has been ground to a powder. In the recovery of either gold or silver, if zinc shavings are placed in the bottom of the container, gold will precipitate on them.

Copper can be recovered from ores by leaching and electrolysis. Practically all crude copper must be refined, in order to purify it and recover the precious metals, by electrolysis also. In a solution of copper sulfate the crude copper is made the *anode* (negative electrode) and a sheet of pure copper the *cathode* (positive electrode); as the electric current passes through the ore, pure copper is deposited on the cathode. See ELECTROTYPING.

For additional information, consult the various articles on the metals, under separate headings.

METAMORPHIC, *met a mor' fik,* **ROCKS.** See METAMORPHISM.

METAMORPHISM, *met a mawr'fiz'm.* The changes undergone by various rocks since their formation are included under the general term *metamorphism,* from the Greek for *to transform.* The term does not apply to the decomposition or wearing away of rocks, but rather to their construction from decomposed material and to changes brought about by heat, pressure, or chemical action. The most common changes wrought by metamorphism are hardening, as in the case of sandstone and



BRIEF BIOGRAPHY OF A CRUMB OF THE UNIVERSE

The earth is continually colliding with meteors as it travels in its orbit around the sun. We see the result in what we know as falling stars. Usually the meteor fares badly in the encounter, for it runs into the earth's atmosphere at such terrific speed that friction with the air burns it up before it can strike the planet itself. If this did not occur we should all be in imminent danger of being struck and killed; but only very large meteors ever reach ground. Inset shows how the earth meets a meteor swarm.

other sedimentary rocks; alteration of composition and structure, such as occurs in slates and some shales; and crystallization, the best example of which is the changing of limestone to marble. See GEOLOGY.

METAMORPHOSIS, *met a mor′ fo sis.* The various changes in form and appearance that occur in the life cycle of an insect comprise its metamorphosis. If the young insect is a nymph and has some slight resemblance to the adult form, the changes it must undergo consist merely in shedding the skin one or more times, and such metamorphosis is said to be *incomplete.* If, on the other hand, the young form is a larva and bears no resemblance whatever to the adult, it must go through a resting, or pupa, stage and change its form entirely to attain that of the adult; such metamorphosis is said to be *complete.* See INSECTS; LARVA.

ME′TEOR. Often called *shooting stars,* meteors are not stars at all. They are small particles of matter traveling through space, and are not visible unless they happen to pass through the atmosphere of the earth. In the latter case the resistance of the air causes them to glow. Occasionally, there are showers of meteors. These showers move about the sun in paths resembling the orbits of comets, and at regular intervals certain groups pass close to the earth—so close that the earth's attraction is strong enough to draw some of them to itself. One such group comes close to the earth about the middle of November each year, and the shower of meteors is unusually large on that date every thirty-three years. Others, of course, occur at different times.

If the meteor is so large as not to be completely consumed in its fall by friction with the atmosphere, it may reach the earth. It is then called a *meteorite.* Many meteorites have been found, and most museums have some on exhibition. They are composed of the same kinds of materials as are found on earth. Usually, they are of stone, although sometimes one is found composed of pure iron. Their surface is often pitted. Because of their peculiar appearance, they have sometimes been objects of worship. Thus, one was set in the Kaaba at Mecca, the sacred building toward which Mohammedans direct their prayers. See MECCA.

METEOROLOGY, *me te or ol′ o ji.* Called "the working tool of the weather man," meteorology is the science of the atmosphere. It includes particularly a study of the weather and the causes of its changes. Much of the geographical aspect of meteorology is covered by a study of climate (see CLIMATE). Meteorology is a very old science; but observations before the seventeenth century were crude, owing to the lack of instruments. Hence but little progress was made. The reinvention of the thermometer and barometer, a few centuries ago, stimulated meteorological observations, and scientists made a start toward gaining the accurate and reliable information of the present time.

With the invention of instruments, public interest in this subject has been greatly increased, and weather bureaus have been established by various governments for the purpose of making accurate forecasts based on observations and studies of the atmospheric conditions. The application of these observations to the timely forecasting of weather conditions which do damage to commerce, agriculture, products in transit, and businesses of many sorts, allows every precaution to be taken, and results in an annual saving of millions of dollars and thousands of lives. Thus, the disastrous effects of the late frosts of spring and the early frosts of autumn upon farm produce have been greatly reduced by careful data and timely warnings. See WEATHER BUREAU.

ME′TER. Equal to 39.37 inches or 3.281 feet, the meter is the unit of length in the metric system, corresponding to the yard in the English system. Theoretically, the meter is equal to one ten-millionth of the distance from either Pole of the earth to the equator. It was adopted in France in 1799, and its use was made compulsory in 1837. See METRIC SYSTEM.

METHODISTS, *meth'od ists.* Because the members of the United Society, founded in England in 1739 by John Wesley, conducted their lives in a methodical and dignified manner, they were called Methodists. That name is now applied to all religious bodies which sprang from the original society. The United Society grew rapidly in England but did not declare itself independent of the Church of England until 1784, the same year in which the Methodist Episcopal Church was established in America, at a meeting in Baltimore.

In 1845 the question of slavery divided the Church in the United States into two great groups, the Methodist Episcopal Church and the Methodist Episcopal Church South. Another important group formed the Methodist Protestant Church, organized in 1830. In April, 1939, these three branches merged, forming a single organization which was given the name Methodist Church.

The new Church is divided into six jurisdictional areas. Five of these are geographical districts; a sixth area is a nationwide jurisdiction for Negro Methodists. They elect their own bishops and are a self-governing unit within the Church.

Among other branches of Methodists in America are the Free Methodists, organized in New York in 1860; and the African Methodist Episcopal Church for Negroes, which was established in Philadelphia, Penn., in 1816.

In theology Methodists differ little from other Protestant denominations. They have been noted for their great emphasis on the practical application of the teachings of Christ to everyday living, for their belief in the necessity for individual spiritual regeneration or "conversion," and for their evangelistic zeal.

MET'RIC SYSTEM. Weighing and measuring are necessary in carrying on business and in many other activities of daily life. At present two systems of weights and measures are in use—the English system and the metric system. The former system uses the foot, pound, and quart as the units; while the metric system employs the meter, gram, and liter as the units.

The metric system, which originated in France, is widely used except in English-speaking countries. Devised to eliminate the confusion between systems of weights and measures which were different for each

TABLE OF METRIC MEASURES

LINEAR MEASURE

10 millimeters = 1 centimeter
10 centimeters = 1 decimeter
10 decimeters = 1 meter
10 meters = 1 decameter
10 decameters = 1 hectometer
10 hectometers = 1 kilometer
10 kilometers = 1 myriameter

SQUARE MEASURE

1 sq. meter = 1 centiare
100 sq. meters = 1 are
1,000 sq. meters = 1 decare
10,000 sq. meters = 1 hectare

LIQUID MEASURE

10 milliliters = 1 centiliter
10 centiliters = 1 deciliter
10 deciliters = 1 liter (1 cubic decimeter)
10 liters = 1 decaliter
10 decaliters = 1 hectoliter
10 hectoliters = 1 kiloliter
10 kiloliters = 1 myrialiter

CUBIC MEASURE

.000000001 cu. meter = 1 cu. millimeter
.000001 cu. meter = 1 cu. centimeter
.001 cu. meter = 1 cu. decimeter
1,000 cu. meters = 1 cu. decameter
1,000,000 cu. meters = 1 cu. hectometer
10^9 cu. meters = 1 cu. kilometer
10^{12} cu. meters = 1 cu. myriameter

(Note: Sometimes, as in measuring wood, the cubic meter is called a stere.)

WEIGHT

10 milligrams = 1 centigram
10 centigrams = 1 decigram
10 decigrams = 1 gram
10 grams = 1 decagram
10 decagrams = 1 hectogram
10 hectograms = 1 kilogram
10 kilograms = 1 myriagram
10 myriagrams = 1 quintal
10 quintals = 1 tonneau

EQUIVALENTS

1 liter = 1.056 quarts
1 gram = 0.56438 dram

country, the system was adopted in France in 1799, and its use was made compulsory in 1837. It is almost universally used in science and is widely employed in trade. There have been several attempts to establish the system in the United States, but so far there has been little success. The metric system, because it is unfamiliar, seems difficult; but it is actually very simple. Its chief advantages are simplicity and the ease with which calculations may be made. Its universal adoption would eliminate much of the confusion that now exists.

The system is a decimal system; that is, all the divisions of the unit, either smaller or larger than the unit, are arranged in multiples of ten. To illustrate, in the American money system, a decimal system, we write two dollars and fifty-five and a half cents as $2.555; under the metric system, we write two meters and fifty-five and a half centimeters as 2.555 meters.

Subdivisions of the unit are given Latin prefixes, as *milli* for one thousandth; for multiples, or measures greater than the unit, Greek prefixes are used, such as *deca* for ten. The same prefixes are used throughout the system, whether one is talking about meters, liters, or grams. The standard meter, a bar of platinum and iridium which is exactly 39.37 inches in length, is kept in the International Bureau of Measures in Paris. The standard gram is similarly preserved.

METROPOLITAN MUSEUM OF ART. Comprising one of the world's most valuable collections of paintings and art objects, the Metropolitan Museum of New York is the leading art center of its kind in the United States. It was incorporated in 1870, was opened in 1872 in the Dodworth Building, and the next year was transferred to the Douglas Mansion. With a grant of $500,000 from the New York legislature, the first section of the present building in Central Park was opened in 1879; and later, in 1902, the central portion, designed by Richard Morris Hunt, was finished at a cost of $1,200,000, which was paid by the city. Subsequent additions have given the building a total value of $20,000,000.

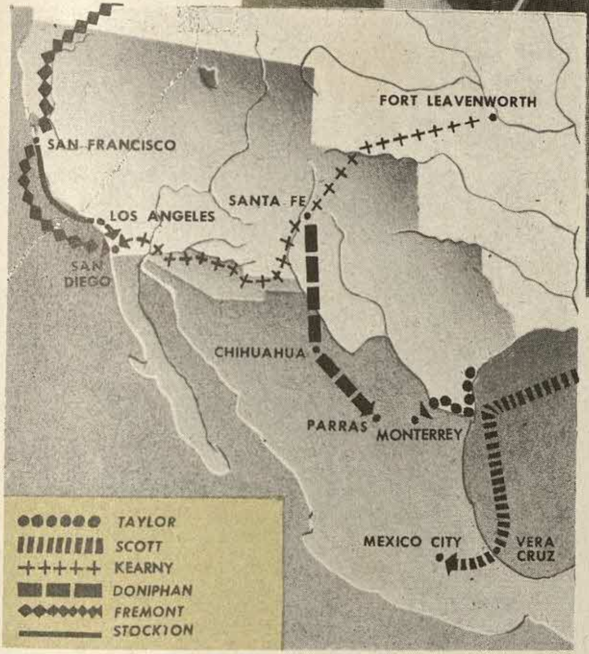
Included among the art treasures of the museum are priceless paintings from the brushes of both European and American masters, special collections of ancient and of Far Eastern and Near Eastern art, tapestries, sculpture, glassware, medieval armor, and ancient jewelry, as well as exhibits of pottery and musical instruments.

METTERNICH, *met' tur nik,* CLEMENS WENZEL NEPOMUK LOTHAR, Prince von (1773-1859). As Napoleon fell, Metternich rose to power. While the great emperor was at the zenith of his reign in France, Prince Metternich was Austria's ambassador to various courts of Europe. He became foreign minister of his country in 1809; and by the time Napoleon was retreating from Moscow, in 1813, he was entrenched in power and ready to dictate the policies of Austria and to influence those of the great powers of Europe. With France defeated by Russia in 1813, Austria took the occasion to declare war on France.

Although he was reactionary and resisted the growing spirit of nationalism, Metternich clung to his authority until the revolution of 1848 drove him to exile in England. Three years later he returned to Vienna, but never regained his former power.

MEXICAN WAR. For years, historians have argued whether the war between the United States and Mexico was justified. Regardless of opinions, the short, one-sided struggle fought in 1846 and 1847 was responsible for adding a huge amount of territory to the United States. Its other results were varied. One result was that it led to distrust of the United States by Mexico and other Latin American countries, which still persists. Another was that it provided a training ground for many Civil War leaders, both North and South.

The causes of the war are hazy. No principle of liberty was at stake, as in the American Revolution; nor was trade or the impressment of seamen involved, as in the War of 1812. Underlying the causes was the desire of the Southern states to add



THE CLASH BETWEEN AMERICAN NEIGHBORS

The map at left shows the routes taken by the various commanders of the United States forces in their successful military drive against Mexico. Above, astride his white horse, is General Winfield Scott, who advanced from the coast to capture Mexico's capital city.

more slave territory to the nation. Another factor was the belief of the people of the United States that Mexico stood in the way of America's natural expansion to the west coast, and that sometime California, Texas, and the territory in between would have to become American.

The immediate cause of the war was an "invasion" by Mexican troops in April, 1846. The Republic of Texas had been annexed to the United States that year; and, although its boundary had been the Nueces River, it claimed land as far west as the Rio Grande. James K. Polk, who became President in 1845, openly advocated securing the West for the United States, and ordered General Taylor and 3,000 men to move into the disputed territory. To resist the Americans, a Mexican force crossed the Rio Grande and defeated them on April 25, 1846. Because of this battle, Congress declared war on May 13.

Five days earlier, Taylor, with 2,300 men, defeated a force of 6,000 Mexicans at Palo Alto, and on May 9 another defeat was administered at Resaca de la Palma. On September 24 Taylor, who had spent the summer at Matamoros, took Monterrey, while other American forces occupied California, Western Mexico, and New Mexico. In February, 1847, Taylor defeated Santa Anna at Buena Vista.

The following spring, General Scott bombarded Vera Cruz and took the city on March 29. In May, Scott launched a drive which took him through the pass of Cerro Gordo; on August 19 and 20 he defeated the Mexicans in three hard-fought battles. A three-week armistice ensued, and then Scott renewed his campaign to take Mexico City. He was victorious again at Molino del Rey, and on September 14, 1847, took over the capital.

The treaty of Guadalupe Hidalgo, stipulating the terms of peace, was signed February 2, 1848, officially ending the war. By its terms the Rio Grande was made the boundary between Mexico and Texas; and California, Nevada, most of Arizona and New Mexico, and parts of Wyoming and Colorado were ceded to the United States. For several years, however, a dispute continued concerning the southern boundary of Arizona and New Mexico, which was settled by the Gadsden Purchase.

For additional information, consult the following articles:

Buena Vista, Battle of
Gadsden Purchase
Guadalupe Hidalgo, Treaty of
Mexico
Palo Alto, Battle of
Polk, James Knox
Santa Anna, Antonio Lopez de
Texas
United States of America

F. Henle

UNDER SUNNY SKIES IN OLD MEXICO

Left, the happy faces of an Indian mother and baby. Right, silver miners at Taxco.

MEXICO. To the south of the United States is Mexico, a land which had built up a flourishing civilization in ancient times. Here today may be seen the ruins of ancient pyramids and temples that tell the story of a proud race who fell before the onslaughts of European invaders. When the pillaging Spaniards first came to Mexico, early in the sixteenth century, they found the country in the possession of the Aztecs, who had a well-developed civilization, perhaps the equal of that of their conquerors. The Aztec civilization had grown up long after that of the Mayas, which had been destroyed by other peoples of high development, such as the Toltecs.

Mexico is a relatively poor land. Although it is richly endowed with natural resources, these resources have not been developed. In contrast to the elegant *haciendas,* or estates, of the wealthy are the innumerable huts of the poor workers and laborers, who make up the greatest part of the population.

There are wide variations in climate and surface. Here are found brilliantly colored and luxuriant tropical vegetation and the dull, drab plants of the Mexican desert.

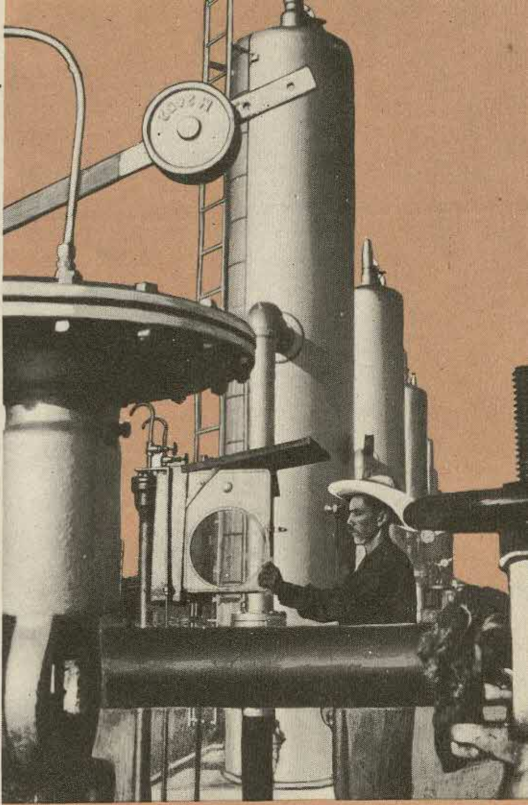
The Land and Its Features. Mexico tapers southward from the United States for about 1,100 miles and then swings east and northeast in a narrow hook, ending in the peninsula of Yucatan. At the northwestern extremity, the long, slender peninsula of Lower California extends southeast, separated from the mainland by the

Gulf of California. More than half of the northern boundary of Mexico is formed by the Rio Grande River, which separates Mexico and the state of Texas. To the east lies the Gulf of Mexico; to the west, the Pacific Ocean. The area of the country is about 764,000 square miles.

The greater part of Mexico consists of a flat tableland, or plateau, lying between two mountain ranges. From the United States border, two chains of mountains extend southeast into Mexico, coming together at the southern tip. These mountains and the plateau occupy nearly all the northern and central part of the country, except for the coastal plain which borders the Gulf of Mexico. The western mountain chain is called the Sierra Madre Occidental and the eastern is known as the Sierra Madre Oriental. Many of the peaks within these ranges are of volcanic origin, and a few of them are partly active.

MEXICO IS SPANISH TO THE CORE
Her architecture and her customs tell us so. Interior walls of the Church of Santa Prisca in Taxco are decorated with gold.

Ewing Galloway

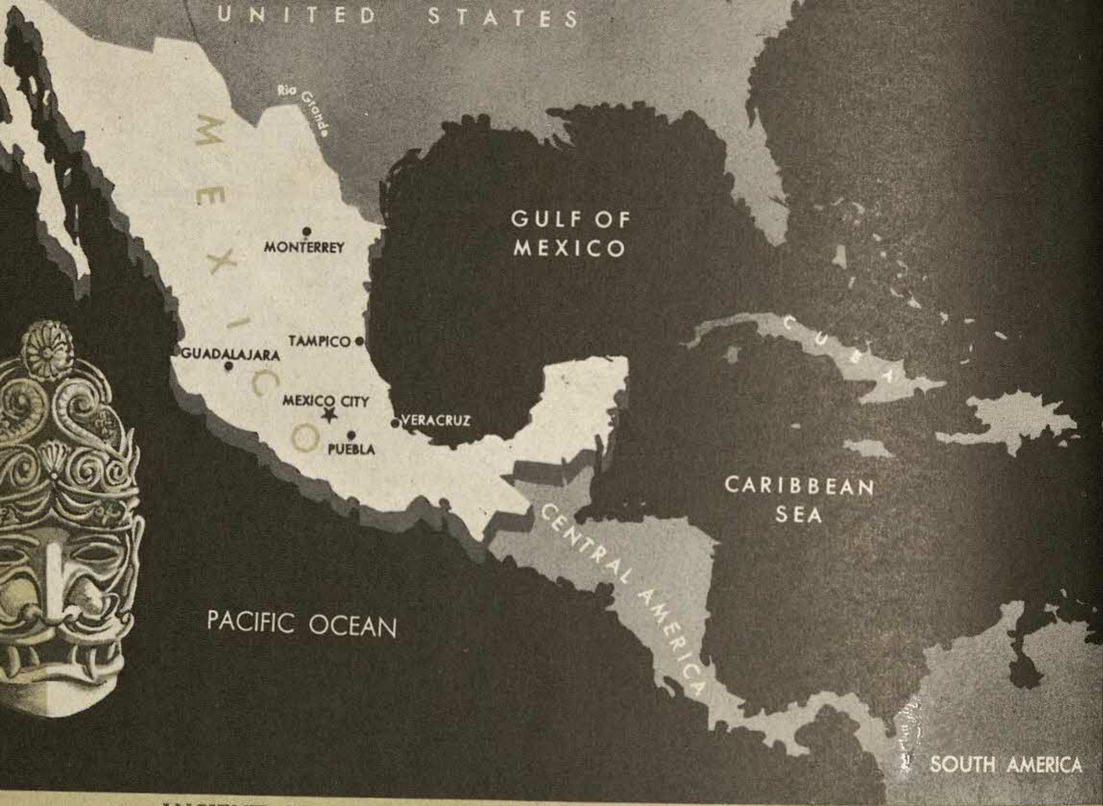


F. He

BLACK GOLD IN MEXICO
Oil refineries are symbols of industrial progr
in the land of the Aztecs.

Mexico has few navigable waterways, but has many rivers which supply water power and water for irrigation projects. The largest river is the Rio Grande, which forms part of the northern boundary. The country has more than 6,000 miles of seacoast, with a number of good harbors; most of them are situated along the rugged western coast, where they are not commercially valuable.

Climate. The Tropic of Cancer crosses Mexico in about the middle of its length, so that one half of the country lies in the torrid zone and the other half in the temperate zone. The climate is determined more, however, by the elevation than by the latitude. Extending along the coast and up to a height of 3,000 feet are the hot, humid lands; from 3,000 to 6,500 feet the climate is temperate and mild; and from 6,500 feet to the snow line the nights are cold, although the days are warm. The rainfall is unevenly distributed, some parts



ANCIENT AZTEC EMPIRE — MODERN AMERICAN REPUBLIC

A long and colorful history provides the background for modern Mexico, which is making great strides in social and industrial progress. The country is rich in tourist attractions.

receiving very little and others getting tropical downpours. The dry season lasts from October through May; the wet one, the rest of the year.

Natural Wealth. One of the world's richest mineral countries, Mexico has several fine oil fields, the most important being those around Tampico. It also produces more silver than any other country, as well as large supplies of zinc, lead, copper, gold, and many other minerals. Like much of its underground wealth, its large coal and iron-ore deposits have been exploited little. Yet minerals are Mexico's leading export, and their extraction is its best-developed industry.

A rapidly increasing number of irrigation and hydroelectric projects are developing more and more of the nation's water power. One of these, on the Papaloopan River, aims to turn a vast wasteland into a productive farming and industrial area. Another, built jointly by the United States and Mexico for the same purpose, includes a series of huge dams on the Rio Grande, the first of which (Falcon Dam) was dedicated in 1953.

Most of the chicle used in chewing gum comes from Mexico's wild sapodilla trees, and rubber is made from guayule, one of its desert shrubs. Its coastal forests and its dense southern jungles provide valuable supplies of pine, oak, mahogany, magnolia, ebony, rosewood, and other lumber, waxes, resins, turpentine, and other useful products. From its rivers, lakes, and surrounding seas come large catches of fish and shellfish. Mexico's beautiful and varied scenery and the delightful year-round climate of much of its Central Plateau are other important natural resources, helping to attract the foreign visitors who flock into the country every year. In recent years tourism has become one of the major sources of Mexico's income.

Farming. Although much of Mexico is

Fritz Henle, Ewing Galloway

IN MEXICO, TIME STANDS STILL FOR THE PEASANT

Farmer bends his back under load of corn, and Indian woman rolls dough for tortillas.

too rugged or dry to be cultivated, agriculture occupies a large majority of its workers. Corn, beans (*frijoles*), and chick-peas (*garbanzos*) — the basic foods of most of the people — are the leading crops, grown in all sections. About half of the world's sisal (henequen) comes from Yucatán. Other important crops include cotton, sugar cane, coffee, cacao, rice, tobacco, chile, wheat, barley, alfalfa, and maguey. Fruits, ranging from bananas, oranges, and avocados to apples and peaches, are also raised in important quantities, as are strawberries, vanilla, and a wide variety of vegetables. Livestock includes cattle, horses, burros, hogs, sheep, and goats. Although farming methods are still generally primitive, modern ones are being introduced, and irrigation projects, better transportation facilities, and the division of Mexico's former huge estates among more of its people have also been improving agricultural conditions.

Manufacturing. Mexico has greatly improved its industrial situation since 1930. Among its leading industries are the processing of petroleum, vegetable oils, minerals, foodstuffs, and beverages, and the making of textiles, clothing, leather, shoes, cigars, cigarettes, drugs, chemicals, iron, steel, twine, paper, furniture, paints, soaps, candles, and fertilizers. Mexican handicrafts, which are extensively sold to tourists and to many foreign merchants, include jewelry, pottery, baskets, hats, and tin, glass, silver, woven, and lacquer wares.

Transportation. Mexico is linked with the rest of the world by air and by sea, its chief ports being Tampico and Veracruz. It is also connected with the United States by rail and modern highways, including its part of the Pan American Highway, which reaches from the United States border to Guatemala. Formerly, Mexico's few modern highways connected only its larger cities, but a rapidly growing network of paved and rural roads is bringing more and more of its isolated villages into contact with its cities.

The People. Many of Mexico's people are the pure-blooded descendants of its early Mayas, Aztecs, and other Indian inhabitants. Yet most are of mixed Spanish and Indian blood, called *mestizos*. A small

F. Henle

SIDEWALK ENTERTAINERS IN A MEXICAN PLAZA
For tourists, much of the charm of Mexico lies in the way of life of its people and the general atmosphere of restful relaxation.

foreign population is made up chiefly of Spanish, English, and Americans. Spanish is the official language of the country, but the Indians speak their native tongue. The population of Mexico is about 32,400,000. The capital is Mexico City, a modern metropolis with a population of 4,500,000, including the close suburbs.

The Spanish element of the population has for nearly three centuries controlled the government, despite the fact that these people were greatly outnumbered by the Indians and people of mixed blood. The latter, however, are taking an increasing part in the conduct of internal affairs. For the most part, they receive little return for their labor and live in poverty.

Education and Religion. According to the law, primary education is both free and compulsory. In 1944, a campaign was launched to reduce Mexico's high illiteracy rate of about forty-eight per cent. In addition to the regular school system there are a number of trade schools and universities, the chief of which is the University of Mexico at Mexico City. The school system is maintained by the national government and the state governments.

There is no state Church in Mexico, and freedom of worship is permitted. In recent years, all Church property has been seized by the government, and at present no Church may own land. The Roman Catholic Church is by far the strongest, there being only a few Protestants and members of other religions.

Government. Like the United States, Mexico is a Federal republic; it has a President, a Senate, and a Chamber of Deputies. The country is divided into twenty-nine states, one territory, and a Federal District corresponding to the District of Columbia. Mexico's second Constitution was adopted in 1917. It is based on the previous one of 1857, but has many features intended to safeguard the religious and economic freedom of the people. It is quite liberal, for it guarantees an eight-hour day, provides protection for working women and children, and attempts to prevent peonage.

The President is assisted by a Council of fourteen, made up of the heads of the various departments of the government. There is no Vice-President. Both Senators and Deputies are elected by popular vote, the Deputies for a term of three years and the Senators for a six-year term. None may be elected for a succeeding second term. At the head of the judiciary is a Supreme Court composed of twenty-one judges. Each of the twenty-nine states has its own government. An amendment, passed in 1938, granted suffrage to women.

History. Before the invasion of the Spaniards in 1521, Mexico was in the hands of the native Indians, the Aztecs. After Cortez had conquered the country, it came to be called New Spain, and he was appointed its captain general. Thousands of Spaniards came to the new territory, chiefly in search of its natural wealth, as they were little interested in establishing permanent settlements. Spain set up a territorial government in 1535 under a viceroy, and for nearly 300 years the country was under the iron rule of the Spaniards.

Although the natives staged several revolts in an attempt to free themselves from Spanish rule, it was not until 1821 that their efforts brought any considerable results. The rebellion, which was begun in 1810 by Hidalgo, a priest, finally brought about the independence of Mexico in 1821. Itúrbide, who had been a Royalist officer, finally turned in favor of independence. He favored getting a Bourbon prince to take the throne of the newly freed country; but, failing in this, he had himself chosen as emperor in 1822. However, in the following year he was forced to resign, and in 1824 the Republic of Mexico was set up under a new Constitution.

Since that time, except for the thirty-four years of Diaz' government, the country has been in an almost constant state of upheaval. It lost part of its territory in 1835, when Texas proclaimed its independence.

F. Hen

MEN'S AND WOMEN'S WORK

Above, wing-shaped nets catch fish on Lak Rátzcuaro in Southwest Mexico. Below, wome of Taxco wash their clothing in stone tubs.

In 1846 the Mexican War began over a boundary dispute with the United States. Defeated, Mexico was forced to cede what is now California, Arizona, Utah, and Nevada and part of Colorado, Wyoming, and New Mexico to the United States.

In 1862-63 the republic was overthrown when a French army gained control of the government and Archduke Maximilian of Austria was proclaimed emperor. After a brief and tragic rule of three years, the young emperor was executed, and the republic was re-established in 1867, with Benito Juárez as President. A full-blooded Indian, Juárez is often called "the Lincoln of Mexico" and is credited with making his country a real nation. Many Mexicans considered his efforts in behalf of the common people to be "radical," however, and in 1876, four years after the death of Juárez, they elected Porfirio Diaz President. Except for a four-year interval, Diaz governed from 1876 until 1911 as a dictator. Although he maintained law and order and encouraged progress in many ways, Diaz' administration benefited chiefly the country's wealthy few and the foreign interests which he urged to buy up Mexico's oil fields, mines, and lands.

In 1910 a revolution broke out under the leadership of Francisco Madero, and Diaz was forced to flee the country. The aim of the revolutionists was to end the "benevolent bossism" of Mexico's upper classes and of the foreigners having investments in the country — to have "Mexico for Mexicans," in which its millions of downtrodden, exploited Indians could share in the nation's wealth and government.

A bloody struggle for power soon began and lasted for years. Some of the leaders of this period tried to improve the people's lot but others only increased their discontent. Relations with the United States were so bad at times that American troops were twice sent into the country. Conflicts between the government and the Roman Catholic Church became serious, as did those between the state and the foreign owners of property in Mexico. Assassinations of Presidents became the rule, and the country seethed with unrest until Lázaro Cárdenas was elected in 1934. During his six years in office, internal peace was restored, many long-needed reforms were begun, and the Mexican Republic made more progress than ever before in its history.

In 1938 the government seized Mexico's foreign-owned oil properties, and for several years had difficulties in marketing its petroleum. Since the payment of the former owners' claims in 1942, however, crude oil and refinery products have again become leading exports and their production has been rapidly increased. The reforms begun under Cárdenas have been continued by his successors. Thus labor policies have been improved, more and more land has been distributed among the common people, and many new schools, hospitals, and clinics have been built. Railway, airline, highway, and rural-road mileage has been increased, and new irrigation-hydroelectric projects

BEAUTIES OF MEXICO—ANCIENT AND MODERN

Tehuan girl smiles welcome. Temples at Chichen Itza tell of Maya culture 800 years ago.

Ewing Galloway, Pemex Motor Club

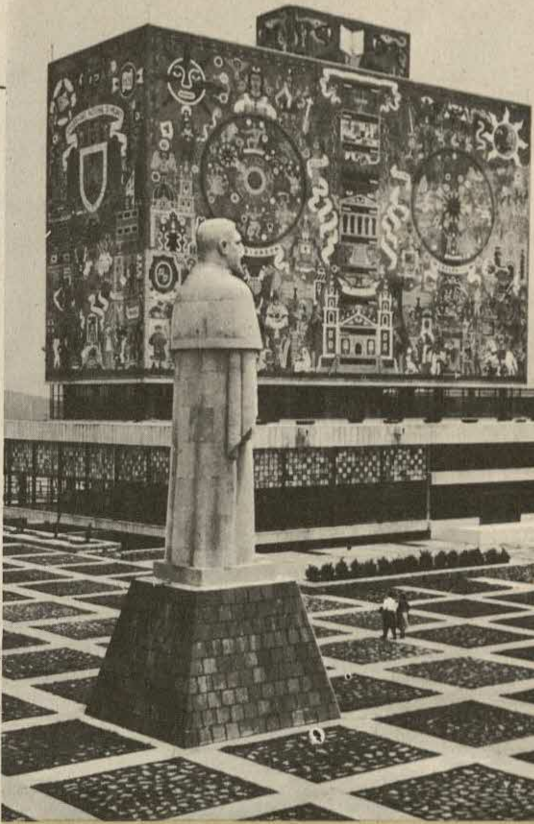
have been built or planned to improve the country's industries and farming. Church difficulties have been settled, and religious freedom is now assured. United States-Mexican relations have become so friendly that the two countries have a mutual-defense pact. During World War II, Mexico joined and greatly aided the Allies. It is an important member of the Pan American Union and of the United Nations.

For additional information, consult:

Aztec
Cortez, Hernando
Diaz, Porfirio
Lower California
Mexican War
Mexico City
Montezuma
Texas
Yucatan

MEXICO, Gulf of. Lying south of the United States, nearly surrounded by the United States and Mexico, is the oval-shaped Gulf of Mexico. It has a coast line of about 3,000 miles and its area exceeds 716,000 square miles. Its location and character have a great effect upon the climate of the United States. Several important rivers flow into it including the Mississippi and the Rio Grande. Along its shores are several important ports, such as Pensacola, Mobile, Galveston, Tampico, and Vera Cruz. The famous Gulf Stream originates here and flows through the Straits of Florida to the Atlantic Ocean, where it turns to the northeast. See Gulf Stream.

MEXICO CITY. Probably the oldest city in North America is the colorful and picturesque Mexico City, for here in 1325 the Aztec Indians established a village from which has grown the capital of Mexico. Situated in the center of the country, on a plateau 7,400 feet above the sea, the city looks out upon a circle of lofty mountains, above which tower Mexico's famous extinct twin volcanoes, "Popo" and the "Sleeping Lady."


UPI

SPECTACULAR MEXICO CITY
Mosaic mural decorates Library of University City. Statue is of former president Aleman.

Mexico's capital is an ultramodern city, with wide boulevards; skyscraper hotels, apartment houses, and office buildings; and many handsome public edifices. Yet it still reflects the influence of its former rulers; much of the architecture is Spanish in style. Among the city's best-known structures are the massive, ancient Cathedral and the National Palace, which face the Zócolo, its main plaza; the Palace of Fine Arts; the Bull Ring, scene of its famous bullfights; and Chapultepec Castle, now a public museum in beautiful Chapultepec Park. The Paseo de la Reforma, connecting this park with the Alameda, is one of the world's finest boulevards.

Besides being the nation's political, transportation, business, cultural, and tourist center, Mexico City has such industries as publishing; printing; the assembling of automobiles, refrigerators, and television sets; and the production of textiles, foodstuffs, leather and rubber goods, cigarettes, soap, chemicals, jewelry, and silverware. With its suburbs, the city has about 4,500,000 residents.

MI'CA. Sheets of this shiny silicate mineral may be easily split off a lump of the material with a knife — sheets sometimes as thin as one three hundred thousandths of an inch. The color of mica is variable — black, green, brown, yellow, white, or colorless being the most common shades. Mica, sometimes incorrectly called *isinglass,* is found in small crystals in many igneous and metamorphic rocks. It is also deposited with sands derived from such rocks.

When found in streams in small flakes, it is often mistaken for gold, because of its brilliant-yellow color and metallic-appearing reflecting surfaces. However, it is easily distinguished from gold by the fact that gold will beat out into thin sheets on an anvil, while mica changes to a white powder when pounded. Mica produced in the United States comes chiefly from North Carolina, New Hampshire, South Dakota, Connecticut, Georgia, and Idaho.

Properties and Uses. Mica has excellent insulating qualities and is used in large quantities as an electrical insulator and heat insulator in toasters, waffle irons, hot plates, and other home appliances. Sheet mica is also used as a resonant diaphragm in phonographs, submarine detectors, and loud speakers. Transparent sheets of mica were once widely used in stove doors, optical lanterns, and lamp shades. Ground mica is sometimes mixed with shellac, which acts as a binder, and pressed into sheets called micanite. Scrap and ground mica is used in Christmas tree "snow," roof tiles, and paints.

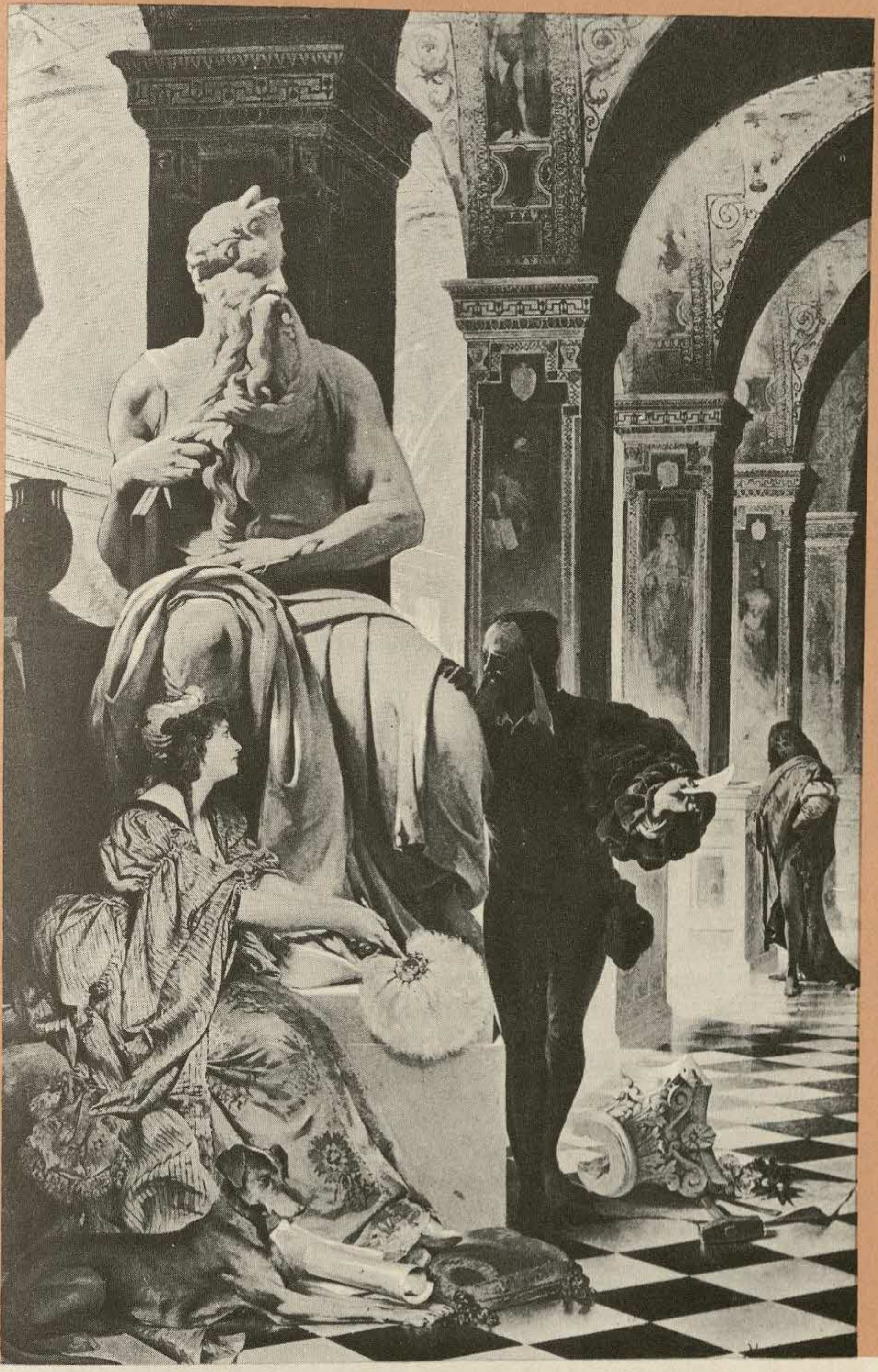
MICHELANGELO BUONARROTI, *me ḳel ahn' je lo bwaw nahr raw' te* (1475-1564). To a world that stresses specialization in all fields, including art, it seems incredible that such a man as Michelangelo ever existed. Not only was he the supreme sculptor of the ages, but he was also a painter surpassed by none, an architect of the first magnitude, and a poet whose creations rank with the finest in Italian literature.

Michelangelo belonged to no "school," yet he was copied and imitated by more men than any artist who ever lived. He was never satisfied with any of his works, yet these same creations are regarded as models of perfection. He was criticized, condemned, and harassed by other artists of his time, yet he gave an entirely new direction to the course of artistic conception. He was the culmination of all that was best in the Renaissance, yet no man was more responsible for the decay of Renaissance art, because his imitators failed to reach his standards.

Born in Caprese, Tuscany, Michelangelo studied drawing and sculpture at an early age, and became a retainer of the court of Lorenzo de' Medici in Florence. After the death of Lorenzo, in 1492, the artist spent some time studying and working in other cities. In 1501 he returned to Florence and carved the heroic *David,* which may be seen today in the Academy of Fine Arts in that city (see illustration on page 1152). Four years later he went to Rome, where he began a monument to Pope Julius II. Like his cartoon, *The Battle of Pisa,* drawn a few years before, the monument was never finished, yet three statues for it, the famed *Moses* and two *Slaves,* are among the greatest in the world.

It was at this time that Michelangelo undertook the painting of the ceiling in the Sistine Chapel, a work that has never been equaled for sublime majesty, grandeur, and technical perfection. After taking a leading part in the defense of Florence against Charles V, Michelangelo returned to Rome, where he painted his superb mural, *The Last Judgment,* in the Sistine Chapel. He also completed other paintings for the Pauline Chapel.

In his later years he turned to architecture, drafted plans for the completion of Saint Peter's, and designed the magnificent dome. His plans for the facade, however, were never carried out. The Farnese Palace, Piazza del Campidoglio, and other buildings bear witness to his unusual architectural style. Throughout the years, he had always written poetry, and in the latter part of his life, following his acquaintanceship with Vittoria Colonna, he wrote a series of sonnets to her.



RENAISSANCE ITALY'S GREATEST SCULPTOR

Michelangelo was the master of his day. His works grace museums and galleries the world over; priceless treasures of art. Here he exhibits his famed statue of Moses.

Abrams Aerial Survey Corp.

LANSING — THE POLITICAL HEART OF MICHIGAN

The capitol, with its spacious grounds, is visible in the center of this aerial view.

MICHIGAN, *mish' i gan.* No other state is so easily recognized on the map as Michigan, for its southern part stands out from the surrounding land like a great mittened hand, and the northern peninsula is like a huge claw. In few states is there such a combination of natural beauty, wealth of natural resources, and industrial development. It is noted as the world's greatest producer of automobiles; it has vast supplies of mineral resources and timber; and its beautiful lakes, extensive pine forests, and abundant wild life attract thousands of vacationers. Michigan has long been called "The Wolverine State."

The state comprises two large and several small peninsulas, and its shores are washed by four of the Great Lakes: Lake Michigan on the west, Lake Superior on the north, and lakes Huron and Erie on the north and east. To the south are the states of Ohio and Indiana. On the southwest the northern peninsula borders on Wisconsin. The total area of the state is 58,216 square miles.

Features of the Land. The northern peninsula is rugged and hilly and contains poor and rocky soil. Crossing it are the Mineral and Porcupine mountains, the latter of which attain a height of about 2,100 feet, the highest elevation in the state. The lower peninsula comprises nearly two thirds of the state's area and is an undulating plain with large areas of fertile soil greatly varied in type and distribution. Michigan is literally sprinkled with about 5,000 small, inland lakes. In the northern peninsula several important rivers flow into Lake Michigan, but the rivers draining into Lake Superior are rapid streams of little commercial value. There are a number of large rivers in the lower peninsula, several of which are important sources of water power.

Michigan's extensive coast line is indented by a number of natural harbors and excellent bays.

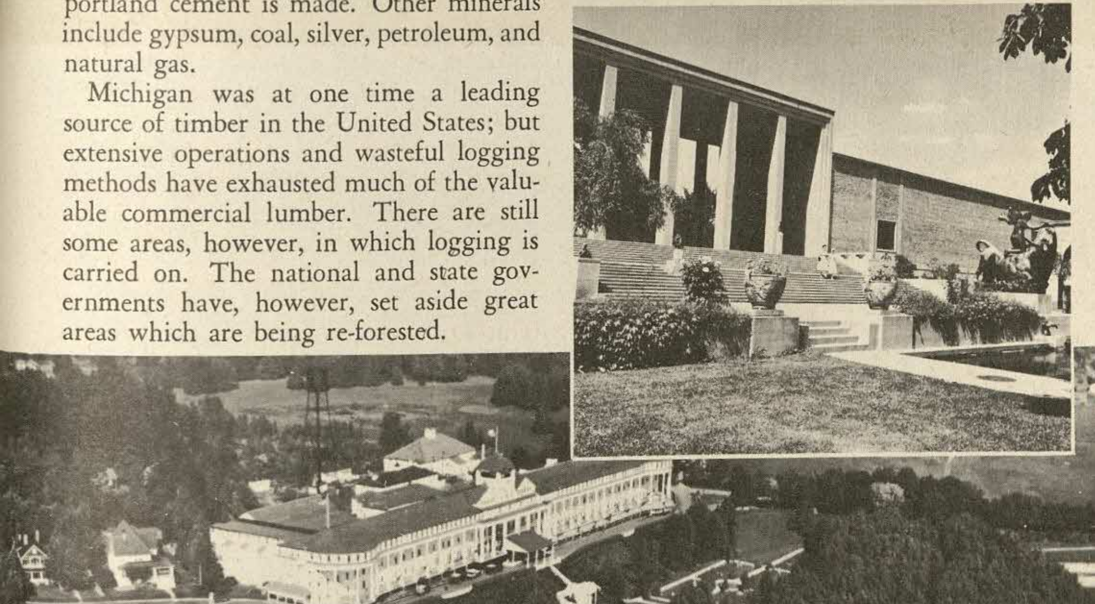
Climate. The climate of Michigan is affected materially by the lakes surrounding both peninsulas. The warm waters of Lake Michigan, supplied by streams to the southward, have a marked tempering effect on the climatic conditions prevailing in the western and northern portions of the lower peninsula and also in the southern portion of the upper peninsula. The warmer waters of Lake Michigan, mingling with those of Lake Superior, have a modifying effect on the Huron side. Prevailing westerly winds in the summer make the shores of Lake Michigan one continuous summer resort. The winters in the northern peninsula are long and severe, but the summers are delightful. The average rainfall of the state is about thirty-one inches.

Natural Resources. Michigan has a great variety of valuable mineral resources. The greatest part of this wealth lies in the northern peninsula. Here is one of the greatest iron-producing regions in the world. On the Keweenaw Peninsula are valuable copper deposits, which at one time produced the largest amount of copper mined in the United States. Michigan leads the nation in the output of salt. There are also unlimited marl deposits, from which portland cement is made. Other minerals include gypsum, coal, silver, petroleum, and natural gas.

Michigan was at one time a leading source of timber in the United States; but extensive operations and wasteful logging methods have exhausted much of the valuable commercial lumber. There are still some areas, however, in which logging is carried on. The national and state governments have, however, set aside great areas which are being re-forested.

The fisheries of the Great Lakes are an important source of income, and the annual catch from Michigan waters is enormous.

Agriculture. In Michigan, agriculture has been greatly influenced by geographical conditions. The fact that the state extends through six degrees of latitude causes variations in farming methods. Thus wheat, corn, grapes, beans, and peaches that are raised extensively in the southern parts are found only in small quantities in the northern peninsula. The fruit belt of the eastern shore of Lake Michigan is famous for its apples, peaches, plums, cherries, and small fruits. In the south-central part of the state is a great peppermint- and celery-producing region. Hay is an export crop in the upper peninsula, and potatoes thrive in the northern counties of both peninsulas.



Michigan Tourist Council

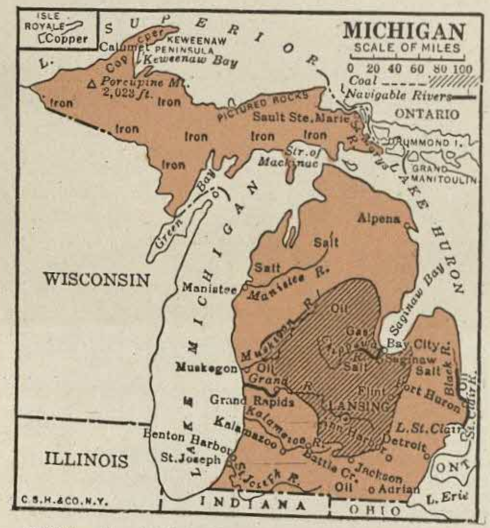
MICHIGAN'S NATURAL AND ARCHITECTURAL BEAUTIES

Michigan's woods and lakes attract sportsmen and tourists, and one of their favorite spots is Grand Hotel on Mackinac Island (top). Cranbrook Academy of Art (bottom) is near Bloomfield Mills. It was designed by Eliel Saarinen, with sculpture by Carl Milles.

Those crops having the greatest value are wheat, oats, corn, sugar beets, hay, beans, potatoes, and grapes. Dairy and livestock raising are important.

Manufacturing. Michigan was formerly a timber state, and the great forests led to the development of the furniture and woodworking industries. Despite the fact that the forests are largely exhausted, Grand Rapids remains one of the leading furniture centers in the United States.

The greatest industry in the state is the manufacture of automobiles. The great majority of the automobiles produced in the United States are made in Michigan, the chief motor centers being Detroit, Flint, Pontiac, and Lansing. Other industrial products associated with particular cities are wire fence at Adrian, cereal products at Battle Creek, paper at Kalamazoo, and wood products at Escanaba.



Among the articles that are produced throughout the state are railroad and farm equipment, mill and foundry products, and a variety of machines. Michigan owes its industrial development to its natural resources and its central location.

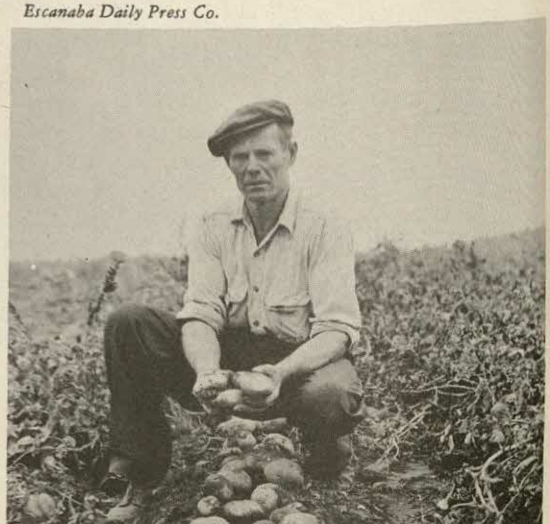
Transportation and Trade. Transportation facilities, on both land and water, are well developed. The lake shores provide good harbors. Many ships are engaged in carrying freight and passengers to and from Michigan ports. By using the Saint Lawrence Waterway, ships can travel between Michigan ports and any seaport in the world. Railroad lines are numerous in the southern half of the state, and they extend east and west, with their main terminals in Detroit. Several of these roads connect the state with Canada. The upper peninsula has railroad lines that connect the leading towns with the major lake ports. The state also has good highways and airline facilities.

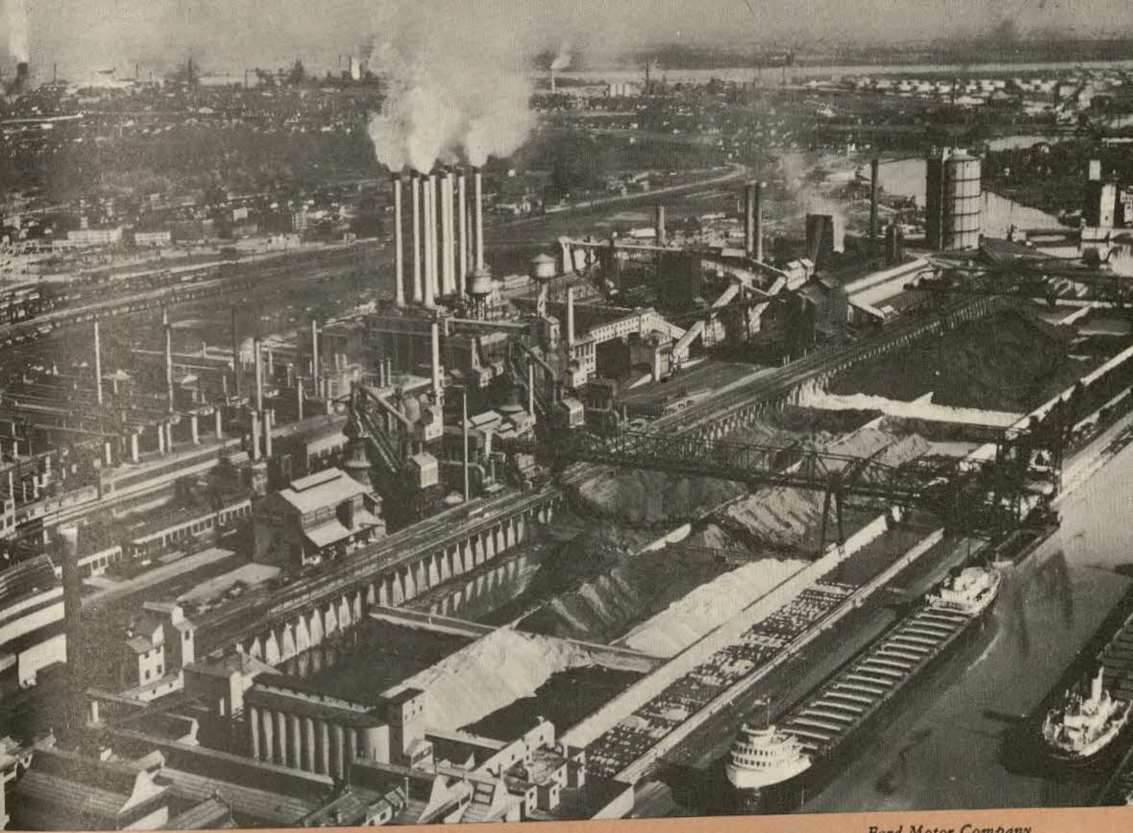
MICHIGAN FARMING THRIVES

Michigan's west coast, from Indiana northward, is one of America's greatest fruit-growing areas. A Traverse City beauty, left, visits the orchards at cherry-picking time. Right, Delta County in Upper Michigan holds the world's potato production record—725 bushels per acre.

Michigan Tourist Council

Escanaba Daily Press Co.





Ford Motor Company

TWO SQUARE MILES OF INDUSTRIAL DEVELOPMENT

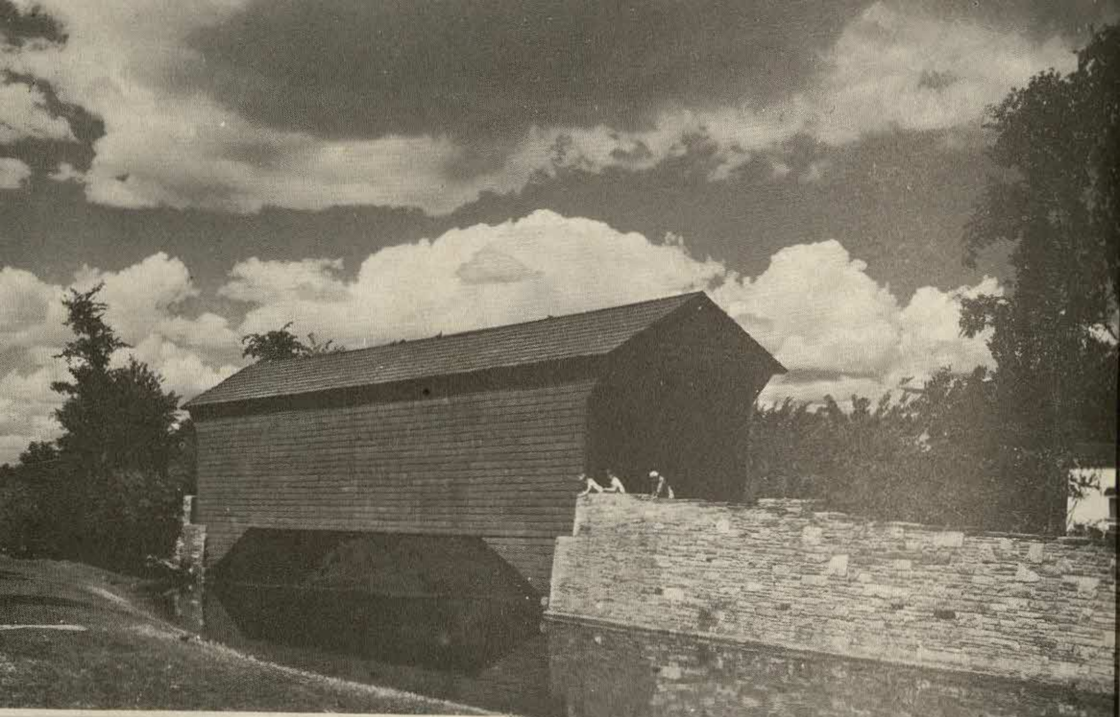
The mechanical and industrial genius of Henry Ford established the famous Ford Motor Company's Rouge plant, near Detroit. Here were developed some of the foundation theories of modern manufacturing methods. There are over 100 miles of railroad in the Rouge.

The People and Their Government. Michigan has a population of about 7,880,000. The greater number of people live in cities. Detroit, the largest city, ranks fifth in population in the United States. Michigan was originally settled chiefly by people from New England and New York; but since the tremendous development of industry, the state has acquired a large foreign population.

The people of Michigan elect a governor and other state officers for two years. There are thirty-four senators in the upper house of the legislature and 110 representatives in the lower house, and both are elected to serve for two years. The legislature meets every two years. A supreme court with eight members heads the judicial system.

Education. The superintendent of public instruction supervises Michigan's school system. School attendance is compulsory for children between the ages of six and sixteen. It is illegal to employ children below the age of fourteen. In addition to the elementary and secondary schools, there are four state teachers colleges, the University of Michigan, the Michigan State College of Agriculture and Applied Science, the Michigan College of Mining and Technology, Wayne University, and Ferris Institute. Among the private institutions of higher learning are the University of Detroit, Alma College, Albion College, and Hillsdale College.

History. Michigan was first explored by the French early in the seventeenth century; and although by 1650 there were a number of temporary settlements, the first permanent colony was not established until 1668, when Father Marquette founded a settlement at Sault Sainte Marie. Then came a permanent settlement on the site

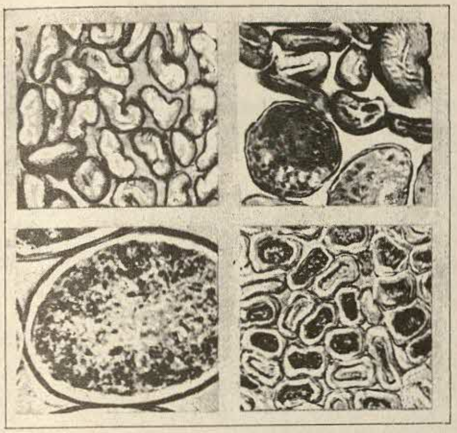


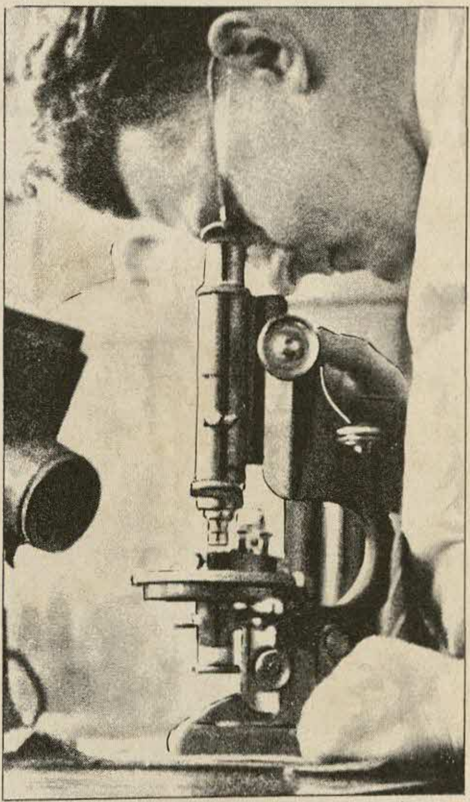
Edison Institute; West Michigan Tourist & Resort Association
AGED CHARM — YOUTHFUL VIGOR
The picturesque covered bridge is one of the ancient structures collected by Henry Ford in Greenfield Village. The sailboats are racing on one of Michigan's innumerable lakes.

of Detroit, begun by Cadillac in 1701. Michigan was part of New France until 1763, when it became English territory. It was annexed to Quebec in 1774, but was transferred to the United States in 1783 by the Treaty of Paris.

Michigan became a separate territory in 1805, after being a part of the Northwest Territory. Several important battles were fought on Michigan soil during the War of 1812. By 1832 the population had reached sufficient numbers to justify the consideration of forming a separate state. Later, when actual steps were taken to form a state government, a dispute arose with Ohio over the southern boundary, and it was not until 1837 that Michigan was admitted to the Union as a state. Detroit was the first capital, but Lansing was selected in 1847. See DETROIT; LANSING.

MICHIGAN, LAKE. One of the most important factors in the development of Michigan, Wisconsin, Northern Illinois, and Indiana has been Lake Michigan, third largest of the Great Lakes and the only one of that group lying completely within the United States. Before the coming of the railroads, this lake was the only means of communication for these states with the populous East. Through the chain of lakes thousands of pioneers came by boat to settle along the shores or to travel farther inland to build farms on the rich prairie soil. Soon an extensive traffic in farm and mine





Right, courtesy Ferro Enamel Corp.

THE MICROSCOPE'S TINY WORLD

These "telescopes in reverse" are invaluable in analysis. Above, fiber slices under the lens.

products was carried on through Lake Michigan to the large cities of the East.

Today traffic on the lake has grown to enormous proportions. Freight boats from Duluth and Canada bring millions of tons of lumber, iron ore, and other minerals to Chicago, Milwaukee, and Northern Indiana every year. There are also regular freight and passenger lines that run between all the large ports along its shores.

Lake Michigan is 307 miles long and 118 miles wide, and has a total area of 22,400 square miles. It receives the water of Lake Superior, which is over twenty feet higher. Lakes Michigan and Huron are about 580 feet above sea level. They both drain into Lake Erie. The Strait of Mackinac connects Lakes Michigan and Huron. Near the southern end the waters of Lake Michigan flow into the Chicago River, and traffic from Lake Michigan can now be taken through the Sanitary and Ship Canal to the Illinois River and on to the Mississippi. Before the canal was built, the Chicago River emptied into the lake. See GREAT LAKES, THE.

MI'CROBE. See BACTERIA AND BACTERIOLOGY.

MICRONESIA, *mi kro ne' shi a.* Including all the territory lying north of the equator between the 180th meridian and the Philippine Islands, Micronesia is one of the four divisions of Oceania, the others being Polynesia, Melanesia, and Australasia. The name Micronesia, which means *small islands,* is applied to the group including the Marshall, Caroline, and Ladrone (Mariana) islands. Originally German possessions, the islands became Japanese mandates and then, after World War II, a United Nations trust territory assigned to the United States.

MICROSCOPE, *mi'kro skope.* The Greek word *micros* means *small,* and a microscope, as its name implies, is an instrument for examining small objects. Like the telescope, it magnifies by bending rays of light so that they appear to come from an object larger than their real source.

The Magnifying Glass. The action of a microscope lens is similar to that of a simple magnifying glass. When a ray from an object enters the glass it is bent, and it is bent again when it emerges. The eye cannot follow the course of a ray, but is conscious only of its final direction. Hence it sees the object as an image. If the object is brought closer to the convex lens, the rays will not be brought together so quickly and the image will not seem as much enlarged. If the object is moved away, it will seem to get larger until near the principal focus (see LENS). At this point it becomes obscure, and if held farther away, will be seen upside down.

The Compound Microscope. If the upside-down, or inverted, image formed by one convex lens is again magnified by a second convex lens, we have a compound microscope. The compound microscope has undergone many improvements and, when ultra-violet light is used, can magnify an object well over 2,000 times. The electron microscope, which beams electrons on the object, has a magnifying power twenty to fifty times greater than that of the finest optical microscope ever built.

The Value of the Microscope. When an object is examined through a good microscope, details are visible which the unaided eye cannot see. This is because many rays of light which would strike the retina of our eye in one place, and make but a single impression, are spread out by the microscope and make separate impressions. It might be said that the microscope has made modern science possible. The knowledge of how plants grow, how insects live, how animals function, as well as much other knowledge that helps make agriculture efficient, is based on information gained through the microscope.

The study of bacteriology is especially indebted to this instrument, and it has been of incalculable value in the investigation of the nature and cause of diseases (see BACTERIA AND BACTERIOLOGY). In industry, the microscope is used in examining metals, fibers, and other materials. By means of the microscope and the camera, bullets are analyzed in crime detection, paintings are tested for genuineness, and the authenticity of wills and other documents is determined.

JOUSTING IN THE MIDDLE AGES

MIDDLE AGES. Civilization almost stood still in the thousand years that constituted the Middle Ages. Feudalism flourished, supported by fear and ignorance, and armed force was the only power respected. The Middle Ages, so-named because they marked a period in history falling between ancient and modern civilization, did not begin or end on definite dates. It is generally agreed, however, that they extended from the fifth century, when Rome fell, until the fifteenth century, when printing came into use and the discovery of new lands stimulated exploration and commerce.

Despite the main aspects of the Middle Ages, the period cannot be termed one of total stagnation, for during this period Christianity in its present form was organized and spread throughout Europe. The Crusades, the Black Death, chivalry, the building of the Gothic cathedrals, and the growth of trade occurred in the twelfth and thirteenth centuries, and helped to bring about the end of the Middle Ages and the breakdown of feudalism.

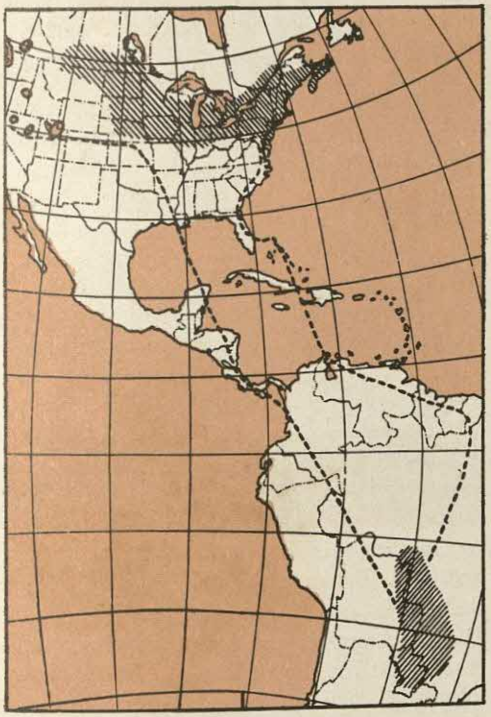
For further information, consult the following articles:

Arms and Armor
Cathedral
Charlemagne
Chivalry
Crusades
Dark Ages
Feudal System
Gunpowder
Printing
Renaissance

MID'SHIPMAN. See RANK.

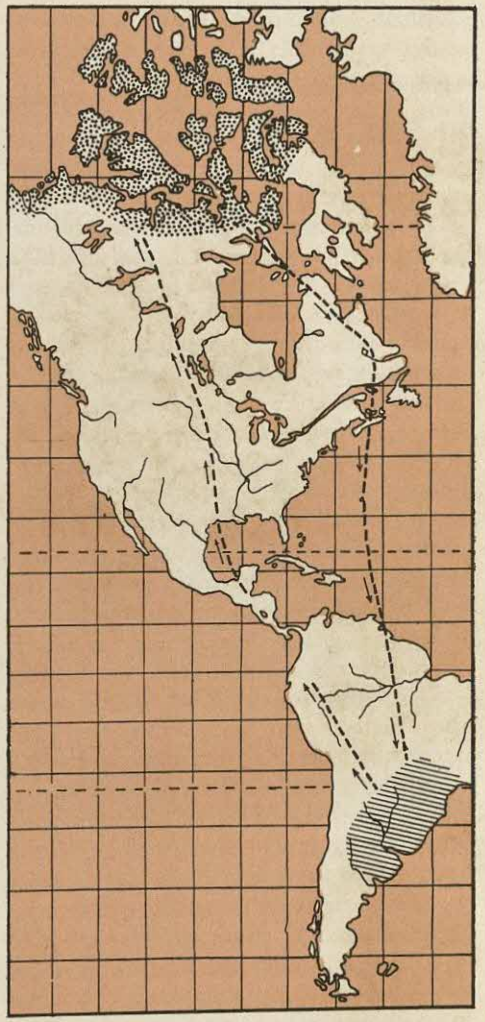
MIGNONETTE, *min yun et'.* The mignonette, or "little darling," is a luxury in any flower garden. "Its sweetness wins all hearts." Everyone should grow a small patch of it. In the improvement of the mignonette, the flowers in some cases have been greatly increased in size, but the colossal blooms are almost without fragrance. Both the fragrant and the improved sorts should be grown, as each is of interest in its own way.

The mignonette belongs to the genus *Reseda,* the name of which means *to appease.* The Romans used the flowers to treat bruises.



BEATEN SKY-PATHS
Migrating bobolinks fly the same route twice each year.

MIGRA'TION OF ANIMALS AND BIRDS. Like early people, many animals are nomads, wandering from place to place in large groups in search of better food supplies and living conditions. Such wanderings, whether occurring regularly each fall or spring, or irregularly, are called migrations, and may affect any animal.



SIXTEEN THOUSAND MILES A YEAR
That's the distance the northland plover flies, seeking equable climates. Ocean flights from Canada to Brazil are made entirely non-stop.

Food is a major cause of a wildlife migration. For instance, deer, bear, and other animals will live in one region for years as long as food is plentiful and danger from other animals is not too severe. But, should a forest fire sweep the area, or a town be built, or the streams of the region run dry, these animals will move somewhere else in order to find a place where food is more plentiful and danger less constant.

Locusts, chinch bugs, army worms, and other insects injurious to farm crops move upon corn and wheat fields in hordes because of the scarcity of food somewhere else. These are migrations which occur spasmodically, although the grasshopper menace moves in cycles of years.

The best example of regular animal migration is the flight of the birds. Bird migration is an inherited instinct, a trait which has come down through generations since the Glacial Period, when there was no food for birds in the icy wastes. In the United States, the birds fly south in August, September, and October, and north in March, April, and May. The principal routes are by way of the Mississippi Valley to Mexico and across the Gulf of Mexico, to the West Indies; along the Atlantic coast; and down the Pacific coast.

For additional information, consult the article on BIRDS.

MILAN, *mil an'*, or *mil' an,* ITALY. Lying but fifty miles south of beautiful Lake Como in Northern Italy is Milan, second largest city in Italy and capital of the province bearing its name. The city lies in the midst of the plain of Lombardy, between the Adda and Ticino rivers. In the center of the city is the Piazzo del Duomo, on which fronts the beautiful and famous Milan Cathedral. Built of white marble in the shape of a cross, the church is 486 feet long, 287 feet wide, and 356 high. More than 4,000 statues beautifully adorn its exterior. Here Napoleon was crowned as Italy's ruler in 1805.

Other beautiful edifices of Milan are the Royal Palace; the Palace of Arts and Sciences (Brera Palace), with a library of nearly a quarter million volumes and a great art collection; and the archiepiscopal palace. The most valuable art treasure in the city is Leonardo da Vinci's *Last Supper,* in the refectory of the Church of Santa Maria delle Grazie.

Milan is famous as the banking and publication center of Northern Italy, and its numerous manufactures include automobiles, jewelry, silks, laces, and hats.

FOCUS OF ITALY'S PO VALLEY
Milan is both rich and beautiful. At the great city's heart is this calm cathedral square.

The city was first conquered by the Romans in 222 B. C. Under Roman rule it became so prominent that at the close of the third century A. D. it was made the capital of Italy by Diocletian. The strongest of all city republics in the twelfth century, Milan two centuries later fell into the hands of the Visconti family, who extended their sway over all of Lombardy. Later, the city was united with Spain under Charles V, and in the early part of the eighteenth century, it fell into the hands of Austria.

The city was made the capital of Napoleon's Cisalpine Republic, and then became the capital of the Napoleonic kingdom in Italy. Following Napoleon's downfall, Milan again fell to the Austrians. They held it until 1859, when it was surrendered to Sardinia along with the rest of Lombardy, becoming a part of Italy. Milan was heavily bombed in World War II. The population is about 1,285,000.

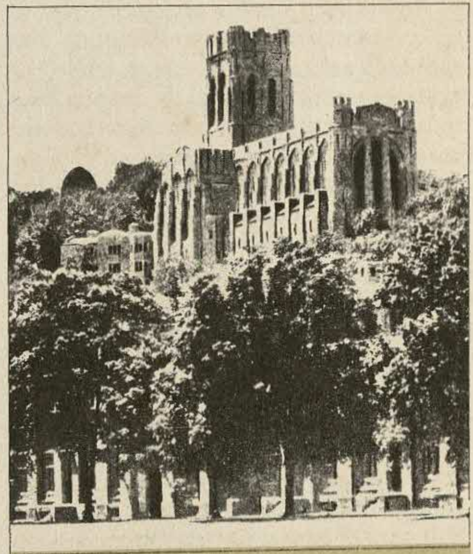
MILAN DECREE. A part of Napoleon's campaign against England, the Milan Decree was issued in December, 1807, and reinforced the following month. It provided that any ship searched by or responsible to the British government, or sailing from a British-owned or occupied port, would be considered enemy property and subject to seizure. See CONTINENTAL SYSTEM.

MIL'DEWS. Especially troublesome in damp places are the mildews, peculiar parasitic fungi that attack paper, leather, cloth, and many other substances. There are two types of plant mildews—*powdery* and *downy*. The former type lives upon flowers, leaves, and stems of plants, sending "suckers" into the tissues, draining the nourishment, and eventually causing the plant to die. There are about 150 species. Dry sulphur or sulphur fumes will ordinarily kill powdery mildews.

The downy mildews are grown within the plant's cells, breaking through the surface only to shed their spores. These are blown away by the wind and soon attack other plants. Downy mildews are the most injurious to plants and are hard to eradicate. Spraying with Bordeaux mixture is one means of control.

MILE. Originating with the Romans, who figured a mile as 5,000 Roman feet, the mile is a unit of measure for long distances. The *statute* mile of England, Canada, Australia, and the United States is equal to 320 rods, or 1,760 yards, or 5,280 feet. The *geographical*, or *nautical*, mile, used at sea, is the equivalent of one sixtieth of a degree of the earth's latitude, or 6,080.2 feet, and is equal to 1.151 land miles. The *kilometer* (0.621 mi.) has been quite generally adopted in Europe for measurement of distances.

Formerly, however, many countries used a "mile" which varied greatly in length. Its equivalent in English miles was: for Germany, 4.61; Russia, 0.663; Norway, 7.021; Sweden, 6.644; Austria, 4.714; Denmark, 4.682; and Switzerland, 2.987. See MEASUREMENTS.



THE ARMY'S TRAINING SCHOOL
Chapel and barracks at West Point, N. Y.

MIL'ITARY ACAD'EMY, UNITED STATES. Overlooking the Hudson River at West Point, N. Y., is the United States Military Academy, built on heights that were important in the Revolutionary War. Here young men are trained for four years in all departments of military activity to become officers in the United States Army. Since the Academy was founded by an act of Congress in 1802, all but a few of the nation's generals and military leaders have been West Point graduates.

A few foreigners may be admitted, and as many as 2,496 Americans may enter the institution as cadets and graduate after the intensive four-year course as second lieutenants in the regular army. The cadet reports on the first week day in July, takes an oath of allegiance to the United States, promises to serve in the army for a certain period after his graduation, and enters upon a preparatory course. Each year, from September 1 to June 4, he takes his academic courses; the summers are spent in camp in practical training. Each cadet receives pay and a food allowance.

All the cadets are officially appointed by the President. The corps is made up of the following: eight from each state at large, recommended by the Senators; four from each congressional district, named by the Congressman from each district; four from each territory (Alaska and Hawaii), recommended by the Delegates to Congress; six from the District of Columbia, named by the commissioners; four from the island of Puerto Rico, and two from the Panama Canal Zone; 172 from the United States at large, of whom three are recommended by the Vice-President and the rest from "honor military schools," from the sons of veterans who died in service, and from the sons of regular servicemen; and 180 from the regular army and National Guard, named by the corps generals and the governors of the states. This over-all system has undergone various changes.

Candidates for admission to the Academy must be between the ages of seventeen and twenty-two, must pass the entrance examinations, given the first Tuesday of March, must pass a physical test, and must be unmarried. The mental examination requires knowledge of algebra, plane geometry, English grammar composition, literature, and United States and general history. Examinations are held at various designated places before boards of army officers.

The Academy came into existence following the strong insistence upon such an institution by George Washington and Alexander Hamilton after the Revolutionary War. Delays followed, and it was not until 1802 that provisions were made for such a school. Several years later, the school was enlarged, and since then improvements and slight changes in administration have been made regularly.

MILITIA, *mi lish' a.* See NATIONAL GUARD; ARMY.

George Pickow, Three Lions

MILK, THE PERFECT FOOD

The cow furnishes us with a nourishing, well-balanced, and economical food.

MILK. The first food of an infant is milk. From that time on, throughout life, milk continues to be of prime importance in the diet. Moreover, it is also important in cooking and in numerous manufacturing processes. Billions of gallons of milk are consumed each year in the United States. In its various forms, including butter and cheese, about a quart of milk for every person in the country is consumed daily.

Milk is the fluid secreted by female mammals for nourishing their young. Cows, goats, and sheep produce it in large quantities, but milk of the cow is of greatest commercial importance.

The Composition of Milk. A hundred pounds of average cow's milk contain about eighty-seven pounds of water, four pounds of fat, five pounds of milk sugar, about three pounds of protein, and a little less than a pound of mineral matter. The water in milk is the same as ordinary drinking water. The fat is composed of tiny globules, so small that there are countless numbers of them in a single pint of milk. It is from these globules that butter is made. The milk sugar, or *lactose,* has a mild, sweet taste and the same food value as ordinary sugar. It goes with the whey in cheese making and with the skim milk in buttermaking, and through the action of certain bacteria changes to lactic acid, souring the milk.

The protein is made up of two substances, *casein* and *albumin*. Casein is the part of the milk which becomes partially solid as the milk sours and is used in making cottage cheese as well as glue, waterproofing, and a variety of other things. The albumin is similar to the white of an egg in its nature and food value. These proteins are exceedingly valuable as food, particularly in building up the muscles of the body.

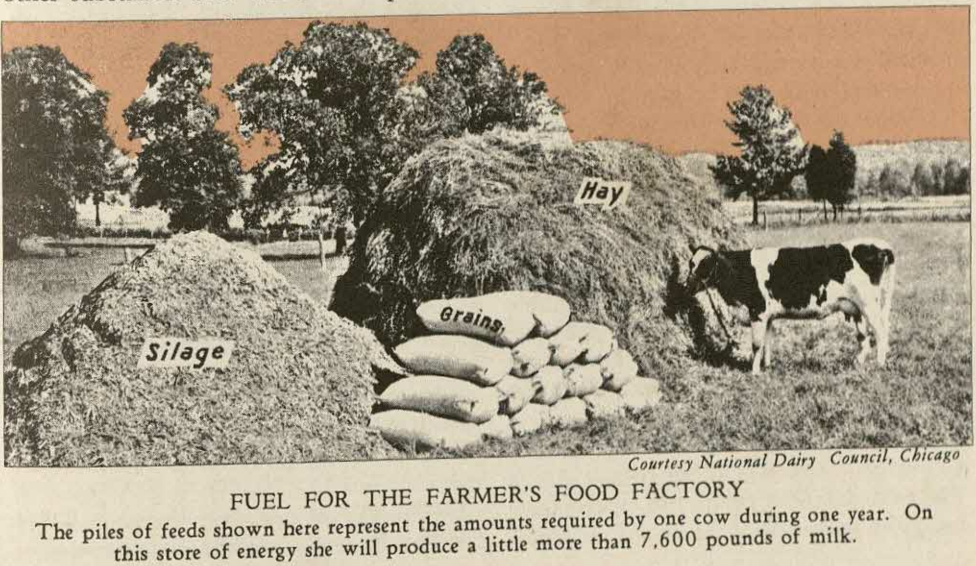
The mineral content of milk consists of calcium and phosphorus, together with chlorine, potassium, iron, sodium, and other minerals. These minerals are important in the body processes, particularly in bone formation.

Because it contains all the ingredients essential to a proper diet, milk is considered a complete food. It is also one of the most easily digested foods. The most expert chemist cannot make a mixture of other substances that will take its place as a perfect food for a baby. Even when it becomes sour, it may still be used in cottage cheese and in the Asiatic beverage, kumiss.

Kinds of Milk. The raw, or whole, milk, as it comes from the cow, is immediately separated, the cream (made up largely of fat globules) going into one container and the skimmed milk into another. The liquid remaining after the cream is churned is buttermilk, a popular and nutritious drink. To keep milk from souring, it may be boiled down to condensed or evaporated milk or reduced to powdered milk.

Homogenized milk is milk in which the globules of butterfat have been broken into smaller ones, preventing the cream from rising and making for uniform richness. Pasteurized milk is ordinary milk that has been heated to about 145°F. to kill infectious disease germs. Certified milk is especially prepared for invalids and babies by bottling the highest grade of milk under the most scientific conditions. It is endorsed and inspected by a medical milk commission.

Caring for Milk. As soon as milk is drawn from the cow, it begins to change. It should, therefore, be placed in cans, cooled immediately to about 45°F., and maintained at that temperature by ice or cold water. Needless to say, the cows,



Courtesy National Dairy Council, Chicago

FUEL FOR THE FARMER'S FOOD FACTORY

The piles of feeds shown here represent the amounts required by one cow during one year. On this store of energy she will produce a little more than 7,600 pounds of milk.

stables, milk vessels, and attendants should be absolutely clean. Milk delivered in bottles should be immediately placed in a refrigerator, as its keeping sweet depends upon its keeping cool.

Consult the following titles for additional information:

- Butter
- Carbohydrate
- Casein
- Cattle
- Cheese
- Cream Separator
- Dairying
- Fat
- Food
- Milk, Condensed

MILK, Condensed. By boiling out a part of the water, fresh milk may be changed to condensed milk. This process was discovered by Gail Borden, an American, in 1856. There are two kinds of condensed milk—plain and sweetened. Because it will keep indefinitely, condensed milk is much used in the tropics, on shipboard, in lumber and mining camps—in fact, wherever fresh milk is not available. Candy manufacturers, bakers, and makers of ice cream are also large consumers of condensed milk. In addition, it is extensively fed to babies, since it is easier to digest than is raw milk. In the United States alone, several billions of pounds of condensed milk are produced yearly. *Powdered,* or *dried,* milk has nearly all of its water removed. For further information, see Dairying; Malt; Milk.

MILKY WAY. To the average observer, the sky seems to be dotted with stars grouped very irregularly. Some portions are marked by clusters or groups of bright stars such as the Great Bear group (see Bear, Great); other areas are quite or almost bare. However, if one turns toward that broad band or girdle of hazy light known as the Milky Way, the stars for the most part appear so closely packed that it is hard to distinguish them as separate bodies. The telescope shows that the band is made up of an enormous number of stars, many, of course, invisible to the naked eye.

The Milky Way stretches practically across the whole sky, although it varies in width at different points. In places there are great holes—blank areas within which there is scarcely a star to be seen. One unusually large, starless area in the Southern Hemisphere near the Southern Cross is called by mariners the *Coalsack.*

Modern astronomers believe that the Milky Way is the basic plane of the star system of which our solar system is a part. Our world of stars, or *Galaxy,* is believed to have the shape of a watch or lens, with a long diameter many thousands of light years in extent. Some authorities estimate the distance at as much as 100,000 light years. The smaller diameter is supposed to be one tenth as great. One light year is the distance that light travels in one year, which is at the rate of about 186,300 miles a second.

We see the Milky Way as a hazy stream of stars because, since it is the central plane of our watch-shaped system, the greatest number of stars are found in that portion of the celestial sphere. The blank spaces in the Milky Way are thought to be areas of dark nebulous matter which hide the light of stars behind them.

The Milky Way is so noticeable that it early excited the wonder of man. The ancients wove all sorts of fanciful tales to account for its existence. Thus, in Homer's time they thought it the ocean stream which was traveled by Odysseus (Ulysses) on his voyage to Hades. The American Indians called it the *path of souls.* See Astronomy.

MIL'LET. There are several annual grasses known as millet. Some are important as forage crops and others are used as cereals. In the United States and Canada, all kinds except broomcorn millet are used exclusively for forage and poultry feed. In Africa, India, China, Japan, Chosen, and Russia, broomcorn millet is grown extensively for human food. In this plant the inflorescence, or head, is loose and open like that of oats, resembling a small broomcorn head or brush. In Japan the plant is the poor man's substitute for rice.

MILLET, *mil lay',* Jean François (1814-1875). Painting everyday scenes with a

BY THE PEASANT PAINTER OF FRANCE

This famous painting, *The Gleaners*, is thought by many to be the masterpiece of Millet.

simple charm and appeal that have made his works ever popular, Jean Francois Millet, a noted French artist, attained a prominent position among the Barbizon painters of the nineteenth century. Born at Gruchy, near Cherbourg, Millet studied drawing in Cherbourg and Paris. He remained in Paris until 1849, when he went to live among the peasants at Barbizon, where he produced some of his greatest paintings. Among his masterpieces depicting the life of these peasants are *The Man with the Hoe, The Gleaners, The Sower,* and *The Angelus.*

MILO, *me'lo.* See MELOS.

MILTIADES, *mil ti' a deez* (?-about 488 B. C.). The hero of the Battle of Marathon, fought in 490 B. C., when the Greeks turned back the Persians, Miltiades, a Greek general, is one of the great figures in military history. In the year after Marathon, he led an expedition against the island of Paros, where he was turned back and seriously wounded. Because he had attacked the island for personal revenge, he was fined and, being unable to pay the penalty, was imprisoned. He died shortly after his imprisonment. See MARATHON.

MILTON, JOHN (1608-1674). Throughout the turbulent years of the Civil War and Protectorate in England, a blind poet took up the cause of liberty and Protestantism and later wrote one of the greatest works of literature the world has ever seen. He was John Milton, the man who came closest to filling the void left by the death of Shakespeare.

Milton was eight years old when Shakespeare died, a London boy just receiving the rudiments of an education from his father and tutors. When he was twelve, he went to Saint Paul's School, where he studied the poet Edmund Spenser and modern and ancient languages. Continuing his education, he entered Christ's College, Cambridge, in 1625, where he wrote the famed *Hymn on the Nativity.* After he left the university, he retired to Buckinghamshire to study and write for six years. Here were composed the beautiful *L'Allegro, Il Penseroso, Comus,* and *Lycidas.*

On a journey through Europe, Milton made the acquaintance of such men as Grotius and Galileo, but he was forced to return home upon hearing the news of impending civil war. Engaging in the religious struggles of the time, he wrote many treatises defending the Puritans and attacking the king. Upon Charles's execution, Milton became foreign secretary; and, despite his becoming totally blind in 1652, and despite the death of his wife shortly after, he continued in his position, writing a number of Cromwell's speeches. He married again in 1656, but his second wife died within two years.

In 1660, when Charles II came to the throne, Milton was forced to hide to save his life. His books were burned and a price was on his head. He survived, however, and in 1663 was married for the third time. *Paradise Lost* was published in 1667. He accomplished the work by dictating the lines to his three daughters. Later he produced two other works, inferior to this masterpiece—*Paradise Regained* and *Samson Agonistes.*

MILWAU'KEE, Wis. Built upon high cliffs along the western shore of Lake Michigan is Milwaukee, the largest city in Wisconsin. It is one of the most important gateways to the great Northwest region of the United States for the commerce of the Great Lakes. The city is situated on a bay about six miles wide; the Milwaukee River, joined near its mouth by the Kinnickinnic and the Menominee, flows into the bay. The extensive parks along the lake front, back of which are large public buildings and fashionable homes, make Milwaukee a beautiful and picturesque city.

The harbor has been an important factor in making Milwaukee the leading commercial city of the state. A great part of the city's commerce is based upon shipping on the Great Lakes. Milwaukee has a trading area that includes all Wisconsin, the northern peninsula of Michigan, and parts of other states. It is one of the most important grain ports, as well as a great distributing center for coal. The industrial products of the city include various types of machinery, chemicals, paints, beer, meats, clothing, and leather goods.

Within its beautiful natural setting, Milwaukee has extensive parks and playgrounds, as well as a famous conservatory, a zoo, a fine public library, a museum, and many handsome buildings. In addition to the progressive public-school system, there are such well-known institutions as Marquette University, Milwaukee-Downer College, Concordia College, the Milwaukee School of Engineering, and Milwaukee State Teachers College.

Milwaukee is famous for its efficient government, headed by a mayor and a board of aldermen. There are also several committees and commissions that take part in the administration of the government.

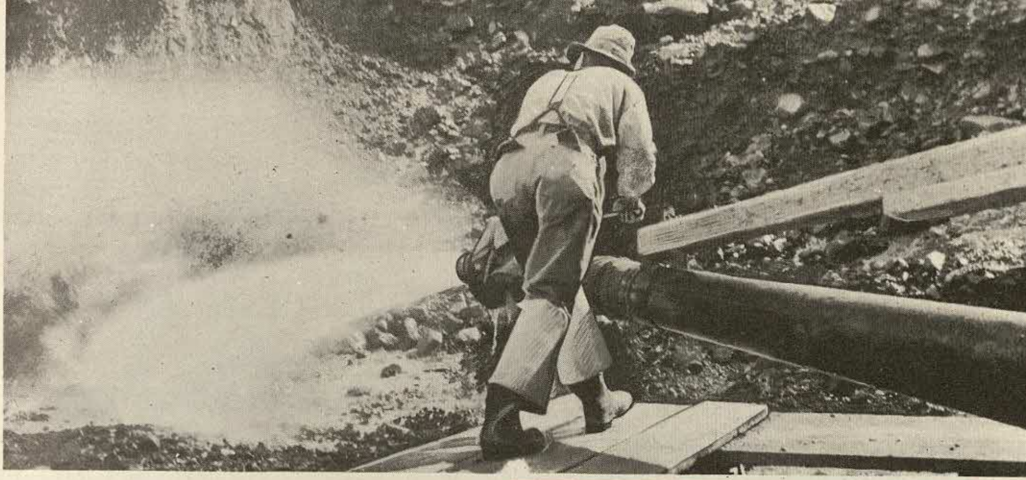
History. Milwaukee was first permanently settled in 1818, when Solomon Juneau built a log cabin on the Milwaukee River. This settlement became known as Juneautown. Before this, Jesuit priests had a temporary settlement here, and it was also the site of an Indian village. Two other settlements, Kilbourntown and Walker's Point, soon sprang up. Later the three settlements joined and were incorporated as the city of Milwaukee in 1846. It now has a population of about 742,000, composed largely of Germans and people of German descent.

MIM'EOGRAPH. See COPYING DEVICES.

MIM'ICRY. See PROTECTIVE COLORATION AND MIMICRY.

MINE, SUBMARINE. See SUBMARINE MINE.

MIN'ERALS AND MINERALOGY, *min er al'o ji.* The materials which make up the earth, and which are essential to the world's industrial progress, are the inorganic, non-living minerals. They include such substances as gold, silver, platinum, aluminum, and many other elements and compounds. Strictly speaking, minerals are substances that have never lived in any form; coal and amber, although they are composed of materials that once lived, are treated as minerals because of their

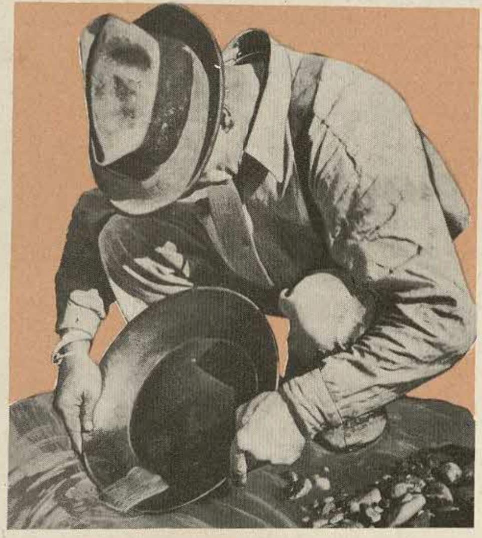


chemical and physical properties, brought about by processes covering long periods of time.

Minerals have no organs, such as those of plants and animals, and they grow only by addition to the outside. They are solids at normal temperature, except in the case of mercury, but they may have been in a molten state at one time. Minerals that are elements unite to form chemical compounds; and when elements or compounds are combined in masses physically, the masses are classed as rocks.

Mineralogy is the science pertaining to the study of minerals. It is closely allied to chemistry, since that science is necessary to determine the composition of minerals. The science of mineralogy classifies minerals on the basis of structure, physical conditions, and chemical composition. Minerals are either crystalline or massive and may be tested for hardness. Mineralogy differs from geology in that the minerals are studied according to their structure and properties; geology regards them as components of the earth's crust. See Chemistry; Geology.

MINERVA, *min ur'va.* Goddess of the Greek city state of Athens was Athena, known to the Romans and the later world as Minerva. She was said to have been born from the head of Jupiter (Zeus), and so was the symbol of intellectual effort. She was usually portrayed fully armed, for she also was the protector of warriors; but in peace, she was clothed with a woman's robe. Her symbols were the aegis and the Gorgon's head.



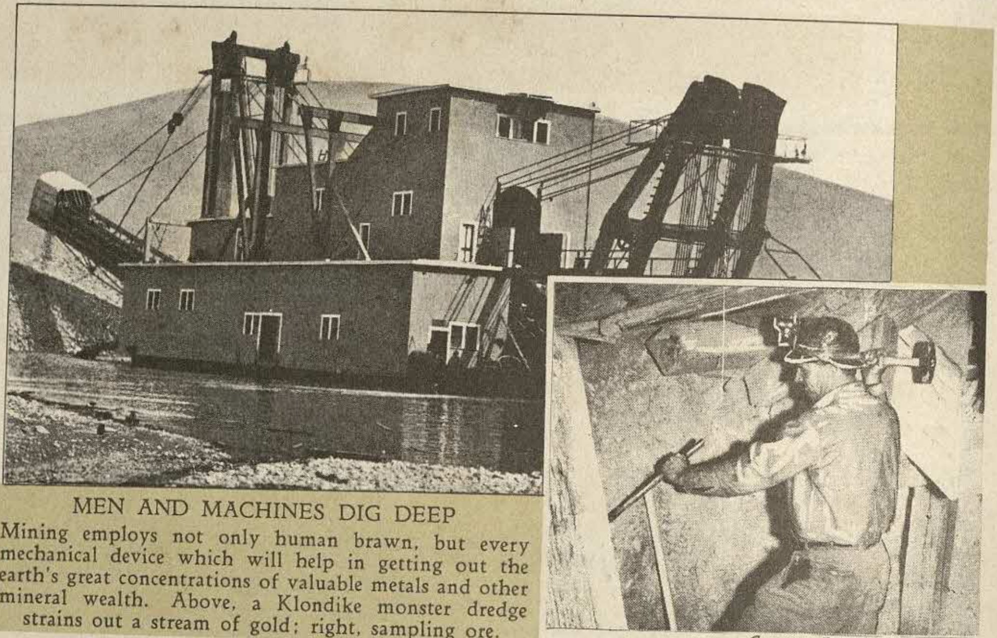
Ewing Galloway, N.Y.

FROM HANDWORK TO POWER HOSE

In Alaska, old and new methods of obtaining gold are carried on side by side. At top, a pressure pump blasts away dirt; at bottom, an old-style gold-seeker washes gravel.

MIN'ING. An old industry that is far more important today than ever before is mining. Through it, man obtains coal, iron, gold, silver, copper, lead, zinc, diamonds, asbestos, and other minerals that are necessities in an industrial civilization.

The first step in mining operations consists of locating a deposit of mineral. It is called prospecting, and a person engaged in this work is a prospector. A prospector searches for various evidences of deposits, such as peculiarities in vegetation, mineral outcrops, and other unusual conditions. After a deposit has been located, it must



MEN AND MACHINES DIG DEEP

Mining employs not only human brawn, but every mechanical device which will help in getting out the earth's great concentrations of valuable metals and other mineral wealth. Above, a Klondike monster dredge strains out a stream of gold; right, sampling ore.

Courtesy Popular Mechanics

be investigated to determine its value and extent, to ascertain whether it would be profitable to work it.

The investigation may be accomplished by surface excavation, by underground shafts, by tunnels, or by drilling. Drilling may be of two kinds: churn drilling, in which the material is washed to the surface by means of water and the material examined at the surface; or core drilling, in which a core is drilled out of the material by means of a hollow drill and brought to the surface.

The working of a mine may be accomplished by different methods, depending upon the material to be mined. There are two general classes—underground working and surface working. The former is used for coal and minerals of various kinds and, occasionally, for clay; the latter, for building stone and valuable clay and mineral deposits which are found near the surface in so-called placer deposits. Surface mining is done with steam shovels or with dredges, if under water, or with hydraulic power (giant streams of water under high pressure, which wash the ore into sluices). Notable examples of the use of steam shovels may be seen at the iron mines of the Lake Superior region and at the copper mines near Bingham, Utah. Gold is mined with dredges in California and hydraulically in Alaska.

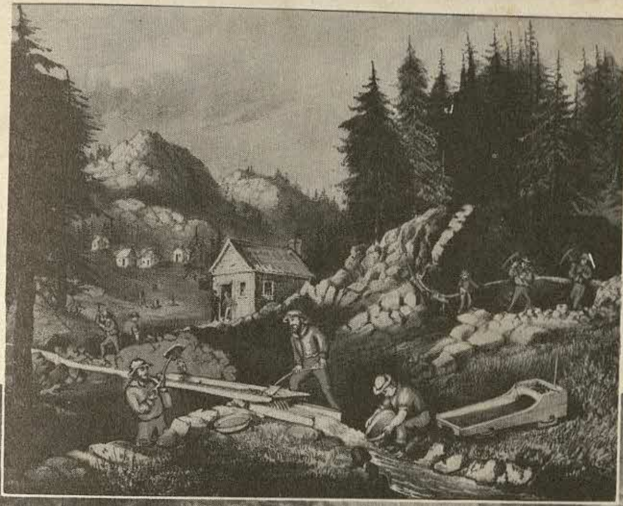
Mining operations require considerable mechanical equipment, such as drills for chopping and breaking the rock; transportation mechanism for moving the material to the surface and into the carriers of the disposal system; drainage or pumping machinery for the removal of water; air compressors for driving the drills, hammers, and other parts of the equipment; blowers for ventilation; and electric power for driving the various units.

The United States maintains a Bureau of Mines at Washington, D. C.; and Canada has a Department of Mines represented in the Cabinet by a Minister of Mines.

For additional information, consult the following articles:

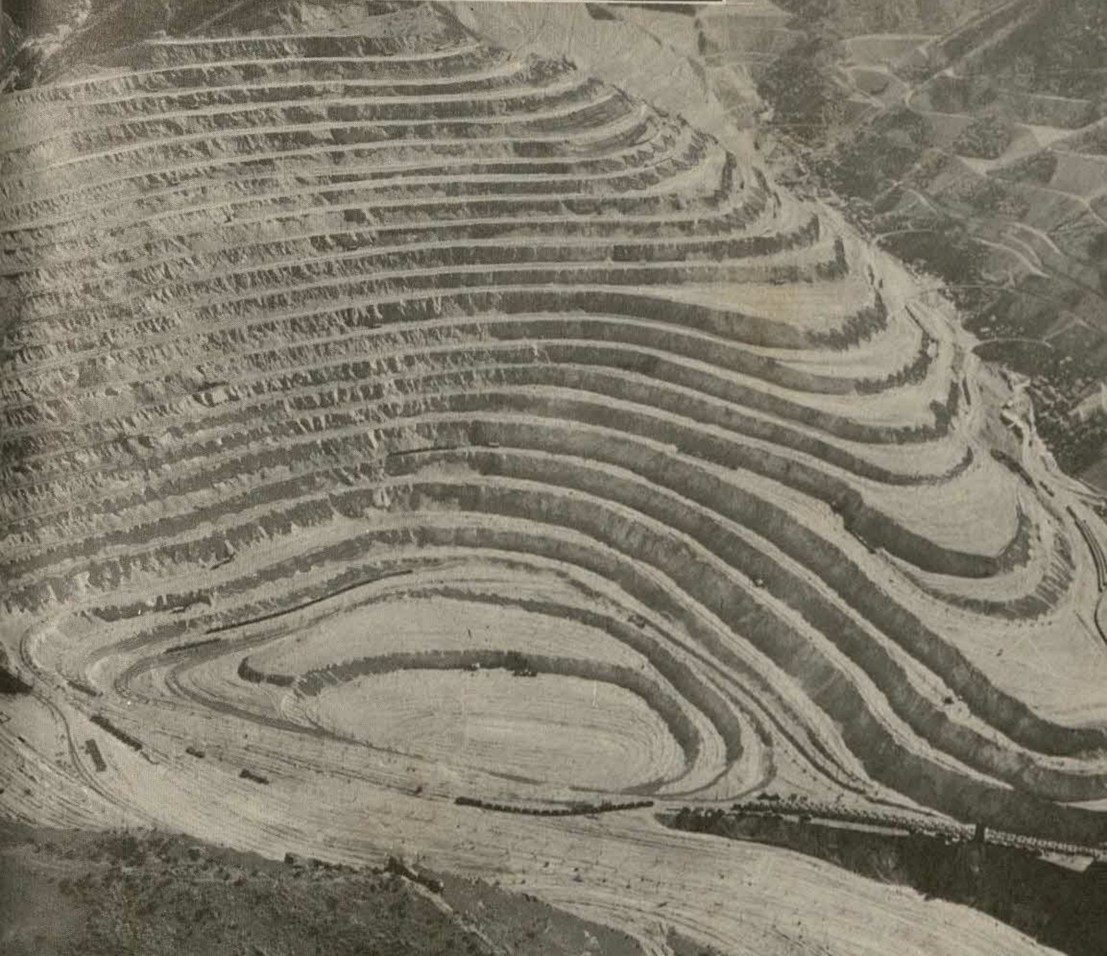
Asbestos
Bronze Age
Coal
Copper
Diamond
Geology
Gold
Iron Age
Lead
Metals and Metallurgy
Minerals and Mineralogy
Silver
Stone Age

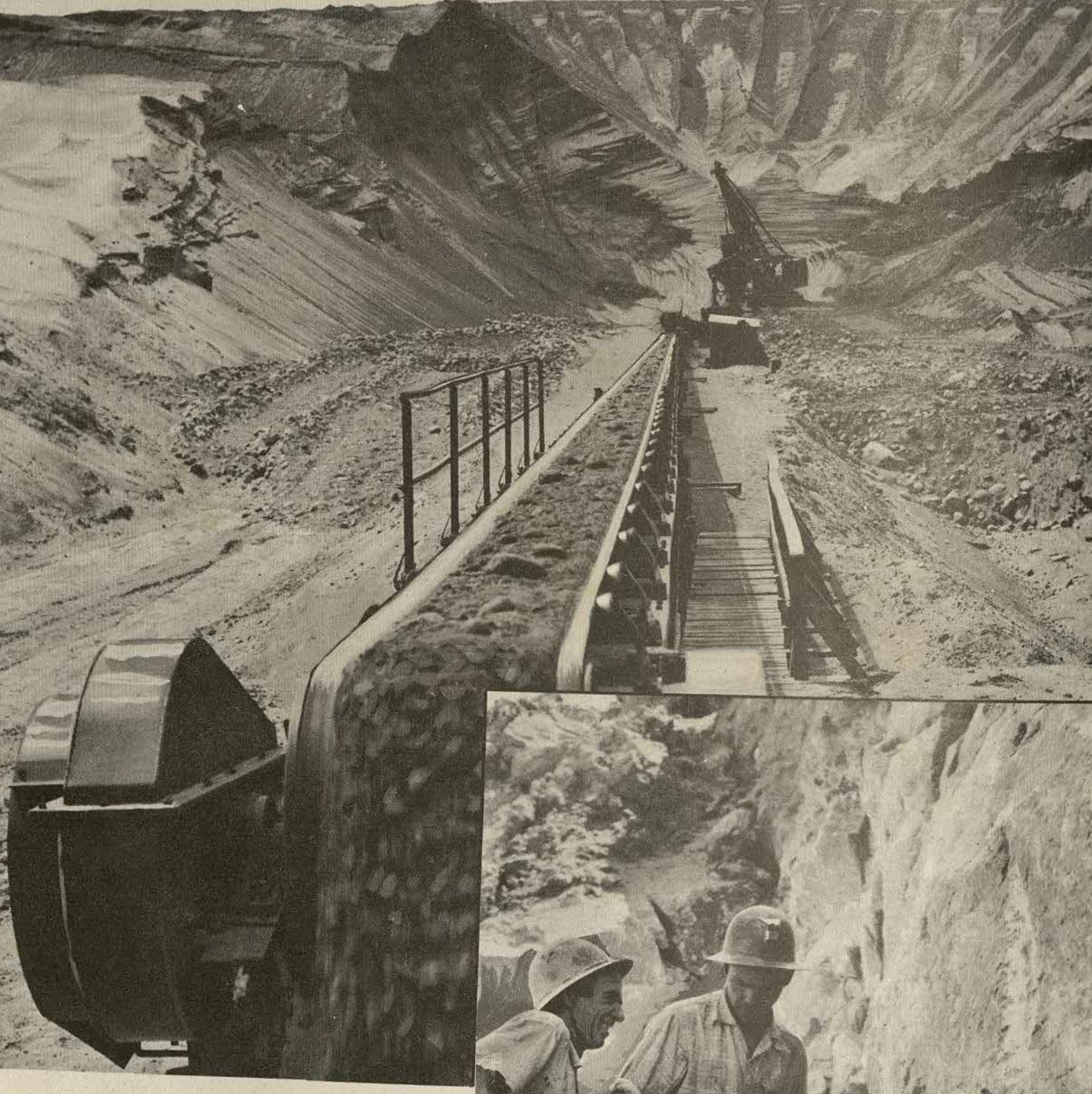
A WONDERLAND ADVENTURE —
TREASURES OF THE EARTH

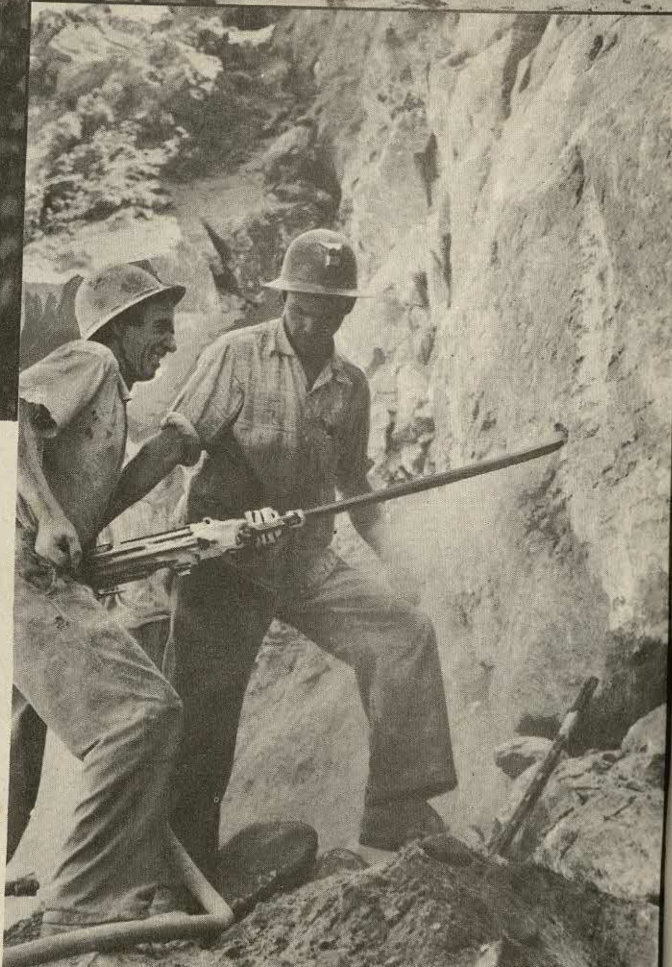


"GOLD!"
Sought more feverishly than any other metal, gold has lured men to deserts, jungles, and Arctic wastes. At right is a scene in the California gold rush.

COPPER FATHERED AN ERA
Copper, chief ingredient of bronze, led mankind out of the Stone Age. Today, in copper mines such as this (below), giant power shovels may mine more than 140,000 tons daily.







MACHINES ARE MANY HANDS

Above, modern mining is done by machines. Conveyors here transport the ore mined by a mighty power shovel. The work these machines do daily would require scores of men equipped with picks and shovels.

DRILLING FOR GYPSUM

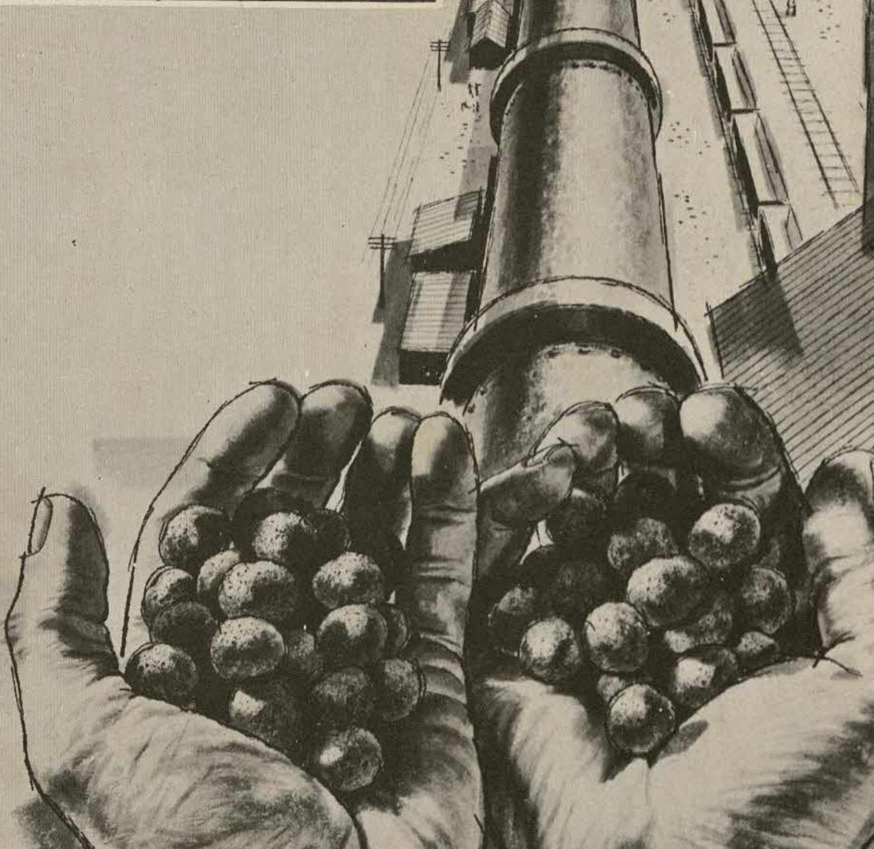
Right, a powerful pneumatic drill rips into a gypsum cliff. The rock will later be blasted loose by an explosive tamped in the drill holes. Most gypsum is used in wallboard, lath, and various plasters in homes and other buildings.

A CAVE OF SALT

Left, the lofty salt chamber being mined here is walled by the remains of an ancient sea, now deep under the ground.

MARBLES SAVED THE IRON INDUSTRY

They are made of powdered iron obtained from taconite, an ore once considered useless. Taconite revived the great Mesabi Range in Minnesota.

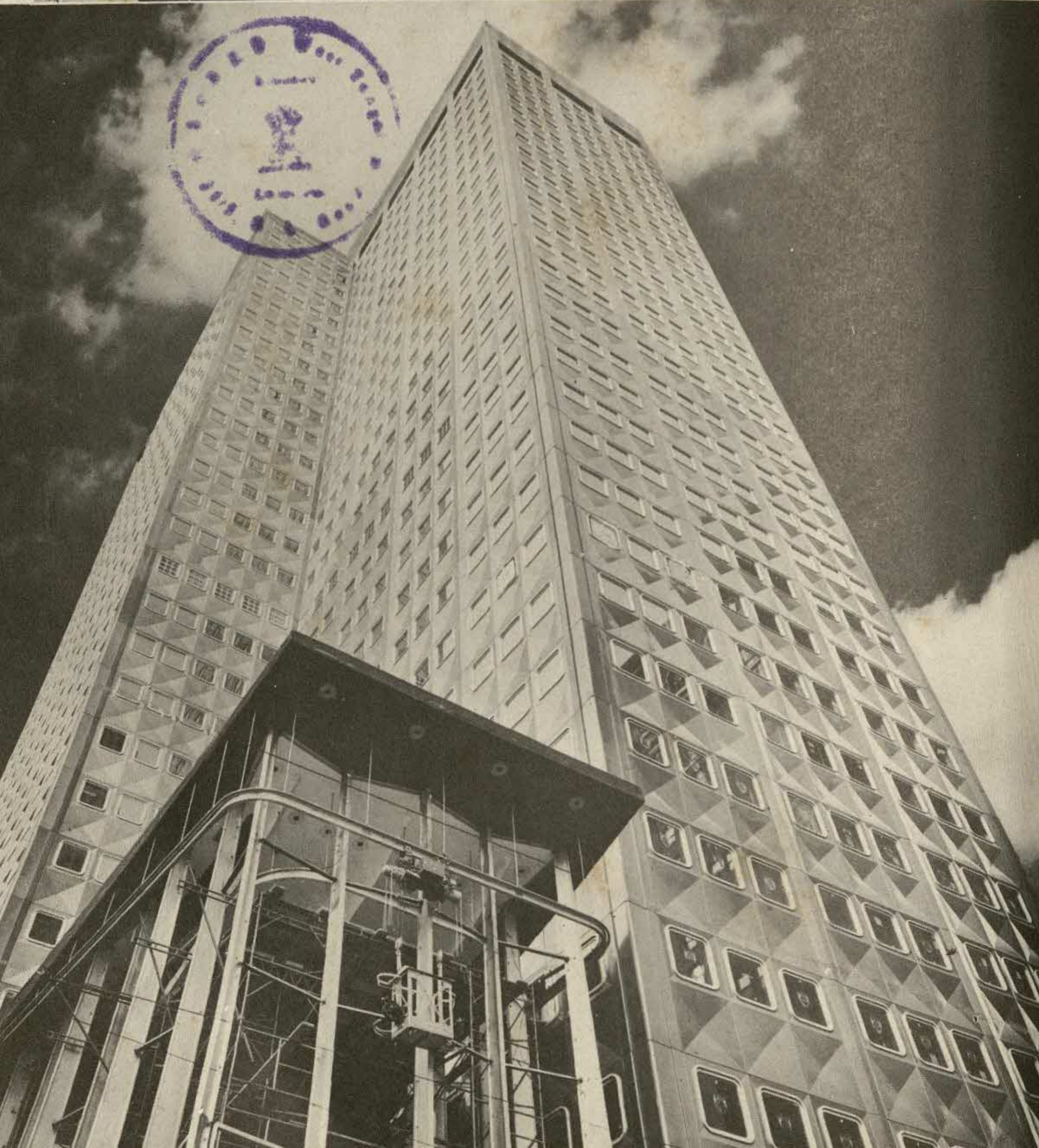


BURIED SUNLIGHT

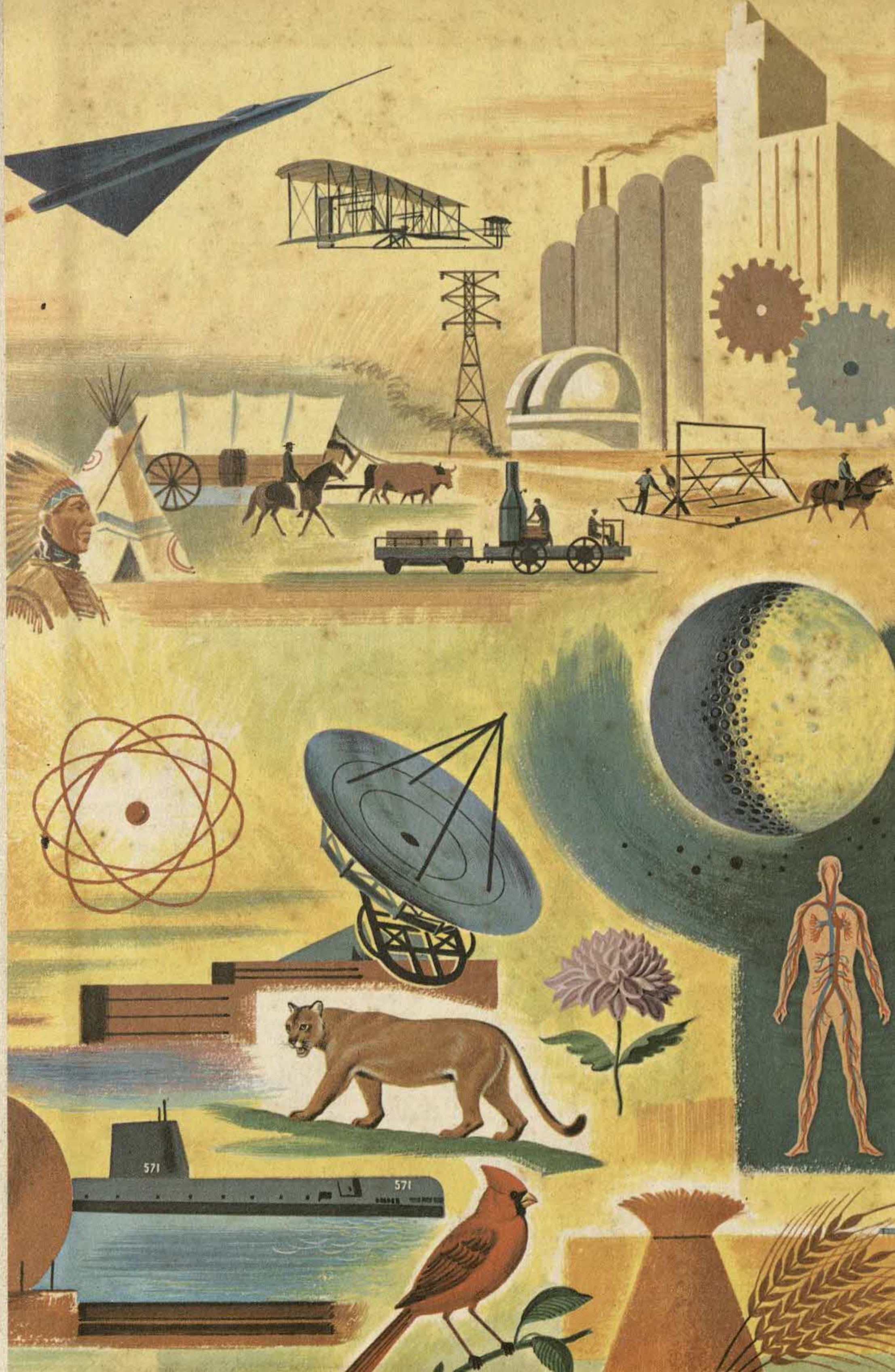
Left, coal stores the energy that prehistoric plants trapped from the sun.

THE CONQUERED METAL

Sheathed in gleaming aluminum, this building marks man's triumph over a metal that defied him for ages. Aluminum, the most plentiful metal, was once so difficult to obtain that a pound of it brought $545 only a century ago.



E=mc²
EINSTEIN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